May 2005, Printed in Japan

2420

TABLE－TOP CENTRIFUGE

INSTRUCTION
and
SERVICE MANUAL

To ensure proper operation of the centrifuge, be sure to read this manual carefully before operating it.
Also, keep this manual handy so that you can refer to it at any time.

NOTE

■The products being indicated in this Instruction manual are designed for operators carrying expert knowledge and these products are to be used by these qualified operators observing the indicated precautions for respective purposes. For persons lacking necessary expert knowledge, these produces may be difficult to use properly and even danger may be consequent upon the use. When the aforesaid persons lacking the necessary expert knowledge are using these products, do so under appropriate supervision and guidance of the qualified operators possessing the necessary expert knowledge.

■Do not distribute this manual within the U.S.A., Mexico, Canada and Australia as the Products advertised in the manual shall not be distributed in the U.S.A., Mexico, Canada and Australia.

For information added or modified after June 2005, please contact your local dealer.

KUBOTA CORPORATION

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[40 Pages]
F3024 1106

WARRANTY

Kubota Corporation ("Kubota") warrants that the instrument covered by this warranty shall be free from defects in material and workmanship under normal use. Kubota will repair or replace, free of all charges, the instrument which, within one (1) year after delivery or fifteen (15) months after shipping, whichever comes earlier is proved to the satisfaction of Kubota to have been defective at the time of delivery, provided that it does not fall under the exceptions and conditions specified in this warranty. Such exception and conditions include, but are not limited to, failure due to natural wear and tear, accident, negligence, alteration, repair, or operation in a manner not prescribed in the Instruction Manual supplied with the instrument. The foregoing expresses Kubotas sole warranty with respect to the instrument.

THIS WARRANTY IS MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED AND EXCLUDED.

Kubota and its authorized dealers will not be liable for any consequential damages, loss or expense arising from the improper use of the instrument. Kubota will not honor any other warranty, which may be given, by its representative or dealer or otherwise which is different from the warranty given hereunder. This warranty is not assignable and is operative only in favor of the original customer to whom this warranty is originally delivered.

Use of Model 2420

Model 2420 can be used for preprocessing in in-vitro analysis, which breaks down blood or urine samples containing plasmas or cells. Accordingly, it is not designed to connect directly to a patient's body.

Do not use the centrifuge for separation of any hazardous material (explosive, chemically active, organic, or radiation containing material, or material contaminated by pathogenic microorganisms) or oil.

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Safety Instructions

The centrifuge and the manual indicate important information in order to ensure safe operation of the centrifuge and to prevent physical injuries and property damages.
Be sure to understand the meanings of the following indications and follow the instructions.

1. Explanation of indication marks

Indication	Meaning
⚠ **WARNING**	It is a possibility of serious accident resulting in death or serious injury.
⚠ **CAUTION**	It is a possibility of accident resulting in slight or non-fatal injury or property damage.

- "Serious injury" is defined as injuries such as loss of eyesight, burn (high / low temperature), electric shock, fracture of bone, poisoning causing aftereffects, or any other injuries requiring a long-term medical treatment at hospital.
- "Non-fatal injury" is defined as burns, electric shock, or any other injuries which does not require long-term medical treatment at hospital. "Property damage" is defined as expansion damage related to damage to equipment or other properties.

2. Explanation of pictorial marks

Pictorial marks	Meaning
	Indicates prohibition (things you must not do). Details are shown near the mark, using illustration or sentences.
	Indicates compulsion (things you have to do). Details are shown near the mark, using illustration or sentences.
	Indicates caution, warning and danger. Details are shown near the mark, using illustration or sentences.
	This label indicates the risk of electric shock. Touching this attached part will cause an electric shock.
	This label indicates a hot section. Touching this attached part will cause an burn.
I	Indicates that the power is on. It is indicated on the power switch and the circuit breaker.
O	Indicates that the power is off. It is indicated on the power switch and the circuit breaker.

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General Notes Be sure to follow them.

Since large electrical and mechanical energies are present on the centrifuge and rotor, reasonable care is required for their handling.
Otherwise, failure may occur resulting in property damages or fatal physical injuries.
In order to prevent them from happening, be sure to follow the instruction given below.

⚠WARNING

(1) Maximum load

Do not exceed the maximum load of rotor and bucket.
The rotor or bucket used beyond the allowable load level can be damaged, thereby causing an accident.

(2) Maximum speed

Keep the rotor and bucket speed below the maximum speed.
Excessive speed may cause damage to the rotor, bucket and the centrifuge. The maximum speed depends on the rotor and bucket strength.

(3) Modification and unspecified parts

Do not modify, nor use unspecified parts.
Unauthorized retrofit of the centrifuge, rotor or bucket, or use of unauthorized parts for them can result in accidents.

(4) Hazardous material

Do not put any hazardous material (explosive, chemically active, organic, or radiation containing material, or material contaminated by pathogenic microorganisms) as a sample of the centrifuge and do not place it closer than 30 cm to avoid a secondary accident should the centrifuge accidentally rotate and contact the material.

(5) While the centrifuge is in operation

While the centrifuge is in operation, do not stand closer than 30 cm to avoid a secondary accident.

(6) Lid

Do not open the lid when the rotor is spinning.
Physical contact with the spinning rotor or bucket may cause serious injury.

(7) Sterilization

Do not perform dry-heat or autoclave sterilization with temperatures higher than those specified. Otherwise, the rotor may deteriorate and cause an accident.

(8) Rotor and drive shaft during rotation

Do not touch rotor and drive shaft during the rotation.
Physical contact with the spinning rotor or drive shaft may cause serious injury.

(9) Damaged, corroded, rusted or deformed

Discontinue use of the equipment when its rotor or the buckets found to have been damaged, corroded, rusted or deformed.
Otherwise failure may occur.

Cont'd. on next page.

⚠ WARNING

(10) Lifetime of rotors

Use of rotors beyond the lifetime may lead to breakage of the rotor.
If the rotor is used continuously even after the lifetime of the rotor has expired, should the rotor get damaged an accident may occur.

(11) Grounding

Do not connect the ground cable to the following places:
1. Gas piping
   Explosion or fire may occur.
2. Ground cable of lightning Conductor, or telephone cable.
   Electric shock may occur in the case of lightening.
3. Water pipes
   City water pipes may not be adequate as a ground since it may consist of plastic piping.

Ensure that the ground cable is connected to the grounding terminal.
This precaution must be strictly observed to avoid accidents due to electric shocks or leakage.

(12) Installation

A clearance of 30 cm minimum must be provided around the centrifuge.
If the centrifuge is driven into uncontrolled rotations due to a failure, secondary damage can result from energy absorbed by the rotation.

⚠ CAUTION

(1) Installation

Do not install the centrifuge on an inclined, slippery, or unstable surface.
Violent vibration may occur.

Do not install the centrifuge in a place where the temperature is below 10℃ or over 40℃.
A place with the ambient temperature beyond 40℃ can introduce undesirable build-up of heat inside the centrifuge and a place under 10℃ can cause the centrifuge malfunction and, as the result, accidents.

Do not install the centrifuge in a dusty place.

Do not install the centrifuge in a place with poor ventilation.
Otherwise inside temperature of the centrifuge may rise, resulting in accidents.

Do not install the centrifuge in a place with high humidity (relative humidity 85% or above).
Leak or accident may occur.

⚠ CAUTION

(2) Toxic or radioactive substances etc.

When centrifuging of substances contaminated with pathogenic bacteria, or toxic or radioactive substances, always use containers that are pathogenic bacteria, toxic substance or radiation proof.
Otherwise. infections. intoxication or radioactive exposure accidents may occur.

(3) Fasten a rotor

Ensure that the rotor is firmly fastened to the drive shaft.
If not positively held in place, the rotor or centrifuge can be damaged, thereby causing accidents.

(4) Bucket

The same type buckets must be provided to every rotor yoke.
If not positively held in place, the rotor or centrifuge can be damaged, thereby causing accidents.

(5) Tuberack

Use the same type of tube racks.
The wrong arrangement will cause imbalance and resulting in damage to rotor, bucket or the centrifuge.

(6) Balance of sample

Keep the load (of the sample, bucket, etc.) balanced.
If an appropriate balance is not provided, unexpected accidents can result from a damaged rotor or centrifuge.

(7) Cushion

Replace the cushion when the glass or plastic tube is cracked.
If the cushion with glass fragment cut to it is used, the tube is easily cracked.

(8) Cleaning

Do not use detergents exceeding the range of pH 5-8 or chlorine detergents for washing purposes.
Corrosion may damage the rotor and bucket resulting in damage to the centrifuge.

(9) Caution plate

Do not remove the caution plates.
When a caution plate becomes dirty, blurred or peeled off, replace it with a new one(caution plates are available at charge).

Usable Rotor

⚠WARNING

(1) Do not use any rotors other than those specified in (2) below.
If rotors other than those specified are used, the rotors may be broken, resulting in a serious accident.

(2) The rotors that can mount as of May 2005 are as follows:
This information is subject to addition or change.
For information after June 2005, please contact your local dealer.

Swinging Bucket Rotor	Plate Rotor
RS-240 RS-1004	RMP-23

Lifetime of rotors

⚠WARNING

Use of rotors beyond the lifetime may lead to breakage of the rotor.
If the rotor is used continuously even after the lifetime of rotors has expired, should the rotor get damaged, the main unit of the centrifuge suddenly may start to rotate; this could result in an accident causing injury or death.

Lifetime of rotors is 7 years after the delivery.

When 7 years have passed after the delivery, discontinue operation of the centrifuge to replace the rotor with a new one.
Earlier replacement, however, is required if any corrosion, lowered strength, flaw or deform due to incorrect operation is detected on the rotor.
In such case, contact your local dealer and be sure to have the rotor checked before reusing it.

Number of times allowed for autoclaving of rotor

⚠WARNING

Stop the use of the rotor immediately when it is used beyond the number of times allowed for autoclaving. Otherwise, the rotor may deteriorate by the heat generated by autoclaving, resulting in deformation or destruction.
Should the rotor get damaged, the main unit of the centrifuge suddenly may start to rotate; this could result in an accident causing injury or death.

The number of times allowed for autoclaving of each rotor should be deemed as follows. When the following conditions has been met, discontinue operation of the centrifuge to replace the rotor with a new part.
Earlier replacement, however, is required if any corrosion, lowered strength, flaw or deform due to wrong operation is detected on the rotor. In such case, contact your local dealer and be sure to have the rotor checked before reusing it.

[1] Number of times allowed for autoclaving and temperature of rotor

Rotor	Temperature of autoclave	Number of times allowed for autoclaving
RMP-23	121℃	50 times
RS-1004	121℃	100 times

[2] Recording autoclave

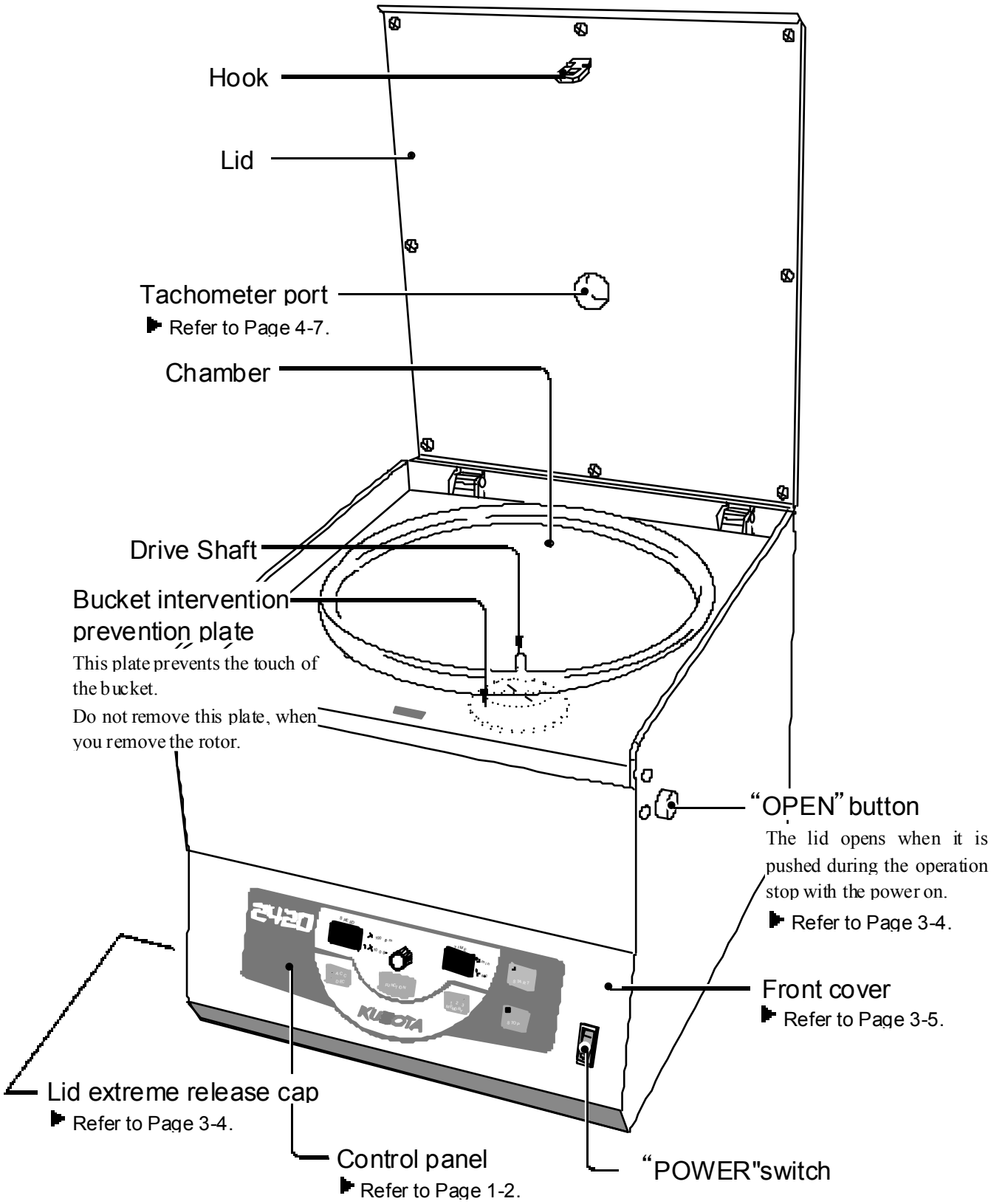
After each autoclave process, be sure to record the following (1) to (3) to control how many times the autoclave is executed.

(1) Date
(2) Temperature of autoclave
(3) Time of autoclave

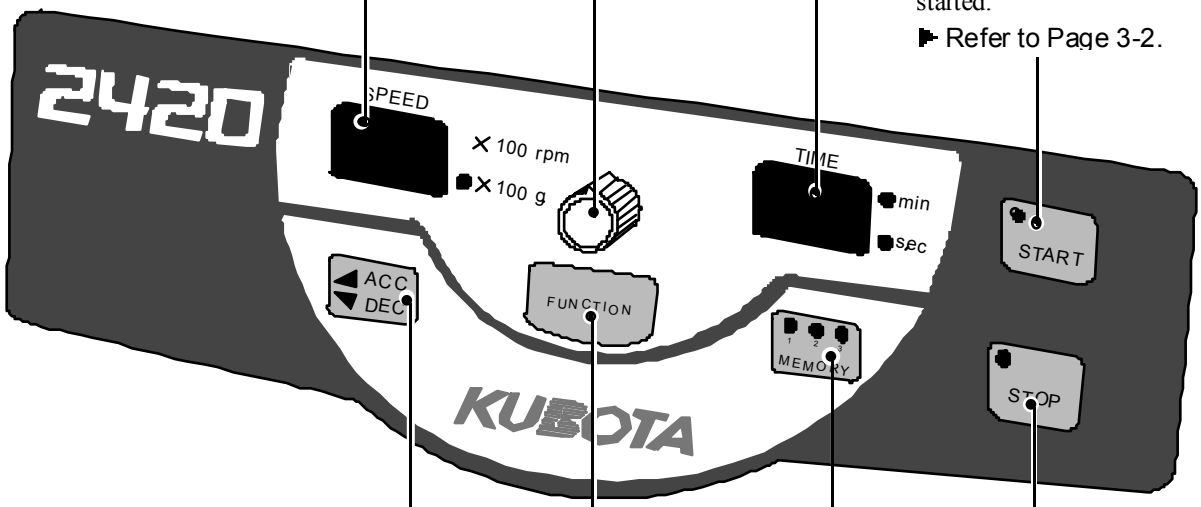
▶ You can take advantage of using the "Autoclave record table" attached to the rotor instruction manual.

Section 1 Component Name and Explanation

1－1. Appearance



1－2. Control Panel



"SPEED/TIME"knob
(Setting the speed, RCF and time.)
Refer to Page 3-6.

"SPEED" display
(Speed / RCF)

"TIME" display

"START" key
When this key is pressed the operation will be started.
Refer to Page 3-2.

"ACC / DEC" key
(To change for ACC and DEC.)
Refer to Page 3-9.

"FUNCTION" key
(To change for speed / RCF and time.)

"STOP"key
Press this key to discontinue operation.
Refer to Page 3-2.

MEMORY selection key
This key allow the selection of saved programs.
Pressing the key will light the lamp.
Refer to Page 3-10.

Section 2 Installation and Power Supply

2－1. Unpacking

When the centrifuge is taken out of a corrugated carton box, check the following.

(1) Upon receiving the centrifuge, examine it for any visible damage caused during transportation.
If any is found, contact the dealer immediately.

(2) Confirm that all the accessories listed in [7 - 2. Standard Accessories] are included with the delivery. ▶ Refer to page 7-1.

2－2. Place of installation

⚠WARNING

A clearance of 30 cm minimum must be provided around the centrifuge.
If the centrifuge is driven into uncontrolled rotations due to a failure, secondary damage can result from energy absorbed by the rotation.

⚠CAUTION

Do not install the centrifuge on an inclined, slippery, or unstable surface.
Violent vibration may occur.

When installing this centrifuge, keep 3meters or more away from AM radio.
Noise generated by this centrifuge causes the sound of AM radio deteriorated.

2－3. Movement of centrifuge

⚠WARNING

- Never move the centrifuge while the rotor is rotating or while the rotor is attached to the centrifuge. Otherwise, the drive shaft may become bent or the rotor and the bucket may come off, resulting in an accident or damage to the centrifuge.
- Ensure that rotor and bucket are removed from the centrifuge and that the power cord is disconnected from the wall socket.
- Moving the position of the centrifuge while the power is turned on may cause electrification accident or functional failure of the centrifuge.

Contd. on next page.

⚠CAUTION

- When moving the centrifuge, lift up the bottom of the centrifuge body by two or more persons using equal forces to move the centrifuge to the desired place.
- Do not drop the centrifuge, otherwise damage or injury may occur.

2 – 4. Power Requirement

⚠WARNING

Prepare a power supply that meets the following conditions.

1. The power supply voltage must be the same as that indicated on the nameplate of the centrifuge and the voltage variation must be within the range given in Table 2-1.
2. The current capacity must be more than given in Table 2-1.
3. In connecting the cord, install a knife switch or circuit breaker of given value in Table 2-1.
   When the centrifuge is connected to an outlet by means of a plug, use a 3-pin plug with a ground terminal.
4. Use single-phase power.
5. The outlet must have a ground terminal and its ground resistance must be less than 100 ohm.

Rated Voltage	100-115V	200-240V
Acceptable Voltage Range	90V to 126V	180V to 264V
Current requirement	8A	5A

Table 2-1 Rated Voltage, Current and Acceptable Voltage Range and Current Requirement

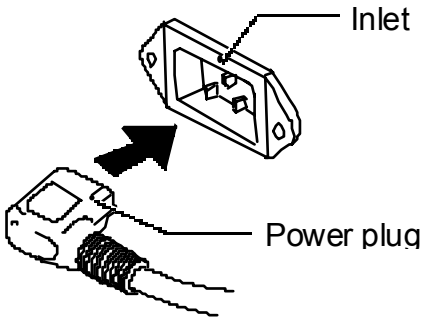
⚠WARNING

- The power cable alone should be connected to the plug socket.
- Do not use a branched plug socket, which may cause overheating or fire.

2 – 5. Grounding

NOTE

When using the centrifuge for the first time, plug the power cable on the centrifuge into the inlet on the back of the centrifuge.



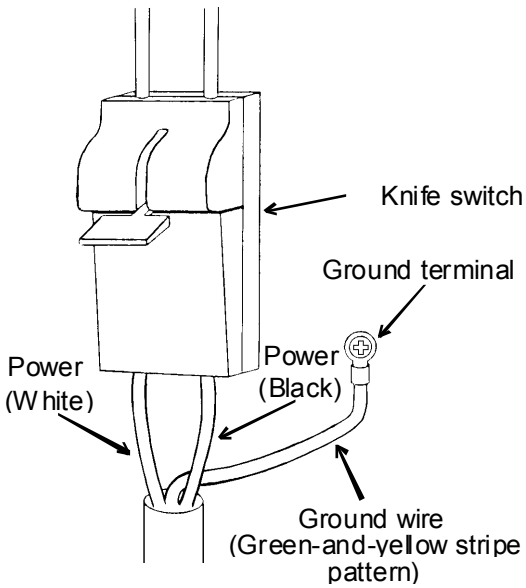
⚠WARNING

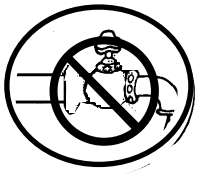
Ensure that the ground wire is connected to the grounding terminal.

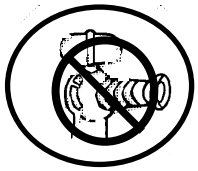
⚠WARNING

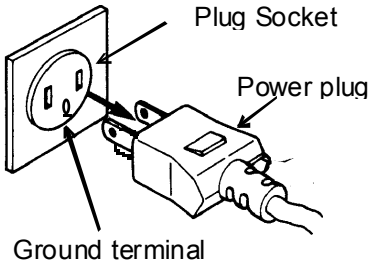
Do not connect the ground cable to the following places:

1. Gas piping
   Explosion or fire may occur.
2. Ground cable of the lightning conductor, or telephone cable. Electric shock may occur in case of thunderbolt.
3. Water pipes
   City water pipes may not be adequate as a ground since it may be connected to plastic pipework.




water pipes


Gas piping



Section 3 Operation

3－1. Cautions of Operation

When using this centrifuge, observe the contents of the Section "General Notes" being described in the front part of this document and the precautions given in respective sections.

3－2. Operation

Operation 1. Turn on the "POWER" switch.

Operation 2. After the "STOP" lamp on the control panel lights, press the "OPEN" button.

Operation 3. Mount the rotor on the drive shaft.
▶ Refer to Section 6.

NOTE
Install the rotor after checking if the "Bucket intervention prevention plate" is installed on the drive shaft.
▶ Refer to page 1-1.

Operation 4. For swinging bucket rotor, mount buckets on the rotor.

Operation 5. Place the sample in the rotor or buckets.
▶ Refer to Section 6.

Operation 6. Close the lid firmly.

NOTE
If the lid is not closed properly the centrifuge is not able to start.
Make sure the lid is closed firmly.

Operation 7. Proceed to *operation 9* when operating with the same setting values as before.

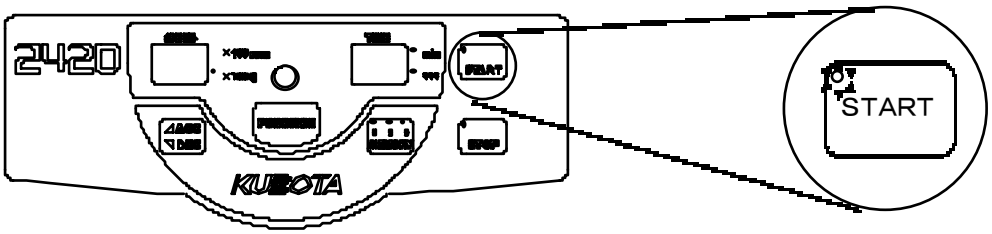
Operation 8. Set the respective parameters.
- Set to required speed. ▶ Refer to page 3-6.
- Set to required time. ▶ Refer to page 3-8.
- Set braking force during deceleration and acceleration speed with the "ACC/DEC" key ▶ Refer to page 3-12.

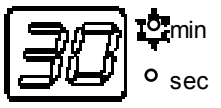
● When the memory has been saved, press the selection key.
▶ Refer to page 3-10.

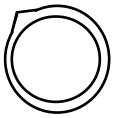
NOTE
Press the "SPEED/TIME" knob to check the "centrifugal force" of the set speed or "speed" of the set centrifugal force.

Contd. on next page.

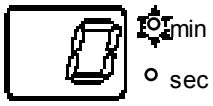
Operation 9. Press the "START"key.
"Pip"sound and lamp on the "START" key lights.

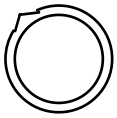






Value on the "TIME" display starts decreasing.



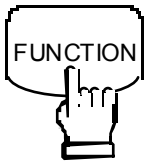


When the value becomes 0 , the centrifuge automatically decelerates and stops.

Operation 10.

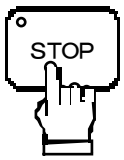
***** In the following case *****

(1) When you want to change the setting (speed, RCF, time) during the operation.
Press the "FUNCTION" key 1 or 2 times on the control panel after changing the setting, and the flashing of the display is stopped.
The operation becomes shifted to the setting that have been changed.



(2) When you want to halt operation, Press the "STOP" key on the control panel.

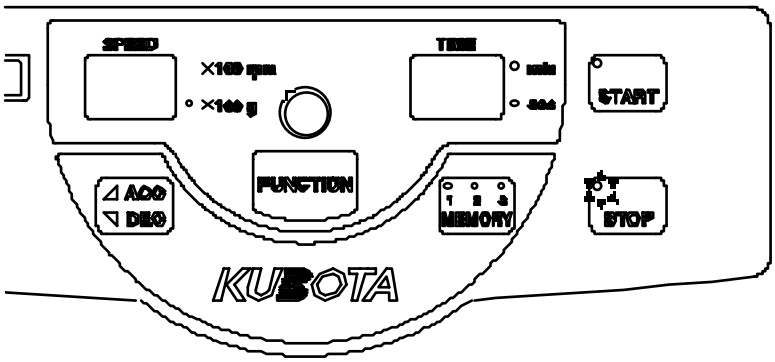
There is the sound and the rotor will come to a halt.



In case that the operation is stopped before the end of the period set by the timer and is resumed, the operation period after resumption is the remained period of the operation.
If the knob is pressed before resumption of operation, the operation period returns to the originally set period.

When the rotor has stopped, the "STOP" lamp flashes and an sound that informs the end of the operation is issued.

- The "Sound that informs the end of the operation" can be selected from the 5 kinds + Sound none. Refer to page 3-14.
- The "Alarm Indicators" to show the end of the operation can be selected from the 5 kinds. Refer to page 3-17.



Operation 11. Press the "OPEN" button to open the lid.
"STOP" lamp remains lit.

Operation 12. Remove the sample.
Refer to page 3-16.

Operation 13. If the centrifuge is to be used again, return to *Operation 5.*

Operation 14. After finishing use of the centrifuge, turn "OFF" the "POWER" switch to turn off the power supply, leaving the lid in opened state.

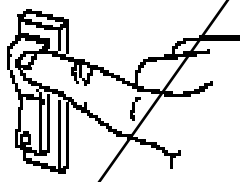
NOTE

If the power is turned off while a memory being called up and is then turned on again, the same memory as displayed before the power cut will be called up and displayed.

Ex. : Turn off the power while "MEMORY 2" called up. Turn on the power, the "MEMORY 2" key lamp will light and the parameter stored under "MEMORY 2" key will be displayed.

3－3. Opening and Closing the lid

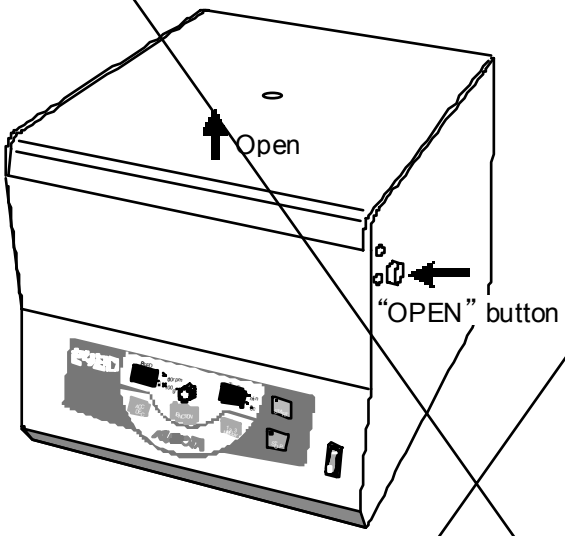
[1] Turning on the power and opening the lid



(1) Turn on the the "POWER" switch to turn the power on. The "POWER" switch locates on the front side panel of the centrifuge.

(2) The 〈STOP〉 lamp on the control panel will be lit.

(3) Pressing the 〈OPEN〉 button the lid can be opened.



NOTE

The lid is locked in following cases and will not open even if the 〈OPEN〉 button is pressed.

- When the rotor is spinning.
- When there is a power failure or the power is turned off.

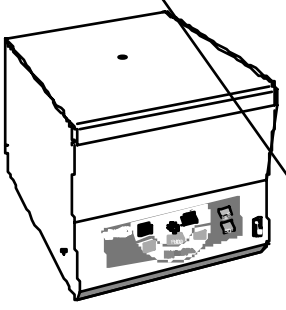
[2] Opening the lid during power failure

⚠WARNING

Do not open the lid while the rotor is spinning.
When a power failure occurs during operation of the centrifuge, the rotor will naturally decelerate to stop its rotation. If the lid is unlocked forcibly before the rotor stops, the person can be entangled in the rotor, resulting in a serious injury or death.

(1) Turn off the "POWER" switch.

(2) By using a flat-blade screwdriver, remove the lid extreme release cap on the lower part of the left side of the unit.
While pulling the string straight, push "OPEN" button. (Do not pull the string too strong.)
Then the lid opens.



◆ If the lid extreme release cap string is cut

⚠WARNING

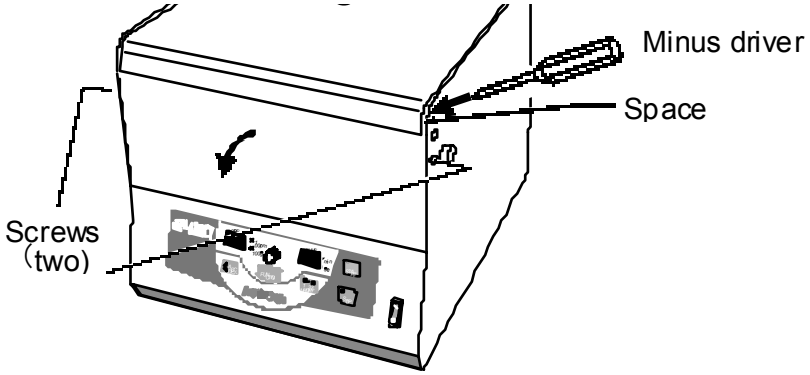
For prevention of electric shock, wait at least 5 minutes before opening the front lid.

(1) Turn off the "POWER" switch.

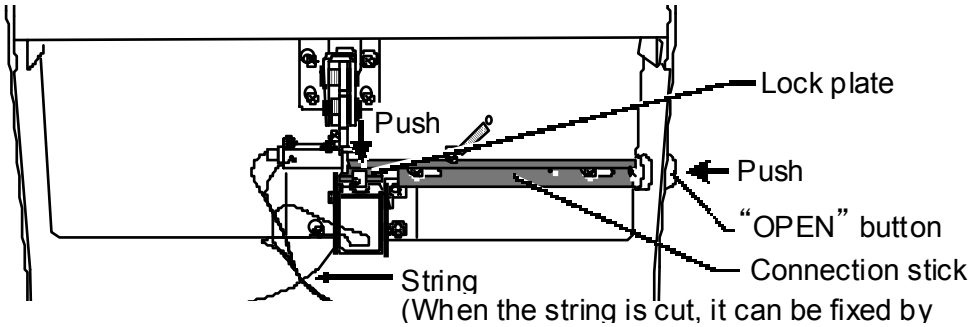
(2) Remove the power supply plug from the outlet.

(3) When more than 5 minutes have passed after turning off the power, remove the 2 screws on the left and the right sides of the centrifuge.

(4) Insert a minus driver into the clearance between the front cover and the centrifuge, and turn the front cover over gently to the front side.

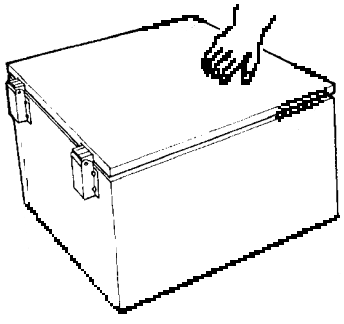


(5) Press the "OPEN" button while holding down the lock plate.
The lid opens after the lid lock has been released.



[3] Closing the lid

Close the lid by pressing the front center of the lid by hands.
Press the lid securely and lock it.



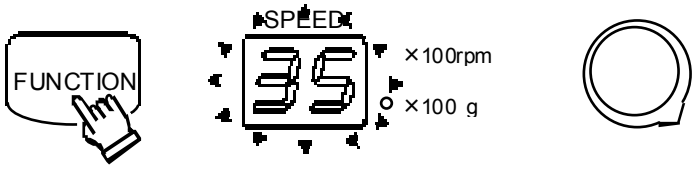
NOTE

The lid can be closed even when there is a power failure or the power is turned off.

3－4. Setting the Speed

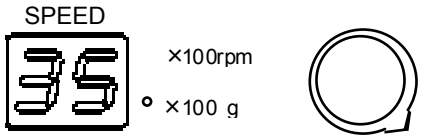
[1] Setting the speed by the rpm

(1) Press the "FUNCTION" key.
The "SPEED" display flashes and indicates the current setting.

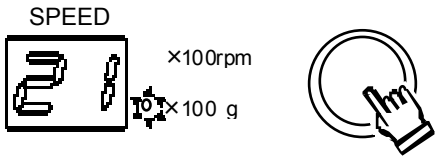


(2) Check if the 〈× 100 g〉 lamp turned off.

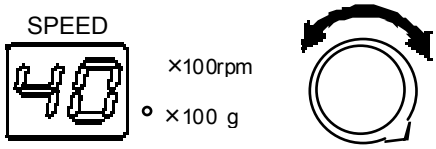
① When the 〈× 100 g〉 lamp is off ····· Proceed to the Procedure (3).



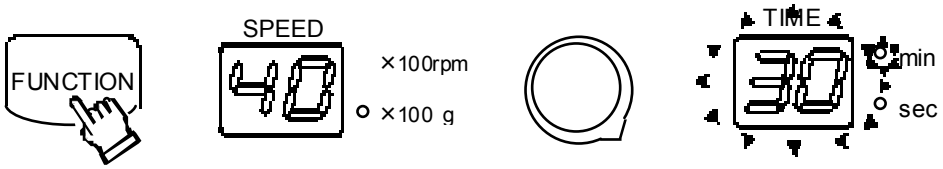
② When the 〈× 100 g〉 lamp is on ····· Press the "SPEED/TIME" knob and the 〈× 100 g〉 lamp turns off.
Proceed to the Procedure (3).



(3) Turn the "SPEED/TIME" knob to set to required speed.
The speed can be set 100 rpm intervals.



(4) When continuing on to time setting, press the "FUNCTION" key.
The "SPEED" display stops flashing and the "TIME" display starts to flash.
(Timer setting status)

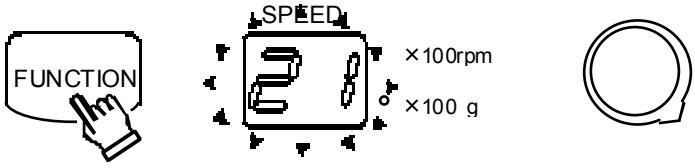


NOTE

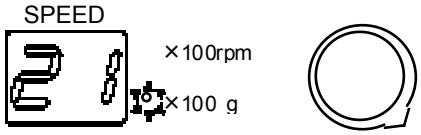
- The centrifuge can be started with the speed on the "SPEED" display, even if the display of value is flashing.
- When you want to change the setting during the operation, press the "FUNCTION" key 2 times on the control panel after changing the setting, and the flashing of the display is stopped.
  The operation becomes shifted to the setting that have been changed.
- The setting order of the speed and the timer can be changed.
  ▶ Refer to page 3-15.

[2] Setting the speed by the centrifugal force (× g)

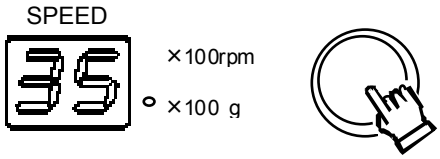
(1) Press the "FUNCTION" key.
The "SPEED" display flashes and indicates the current setting.



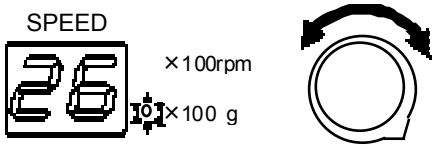
(2) Check if the 〈× 100g〉 lamp turned on.
① When the 〈× 100g〉 lamp is on ····· Proceed to the Procedure (3).



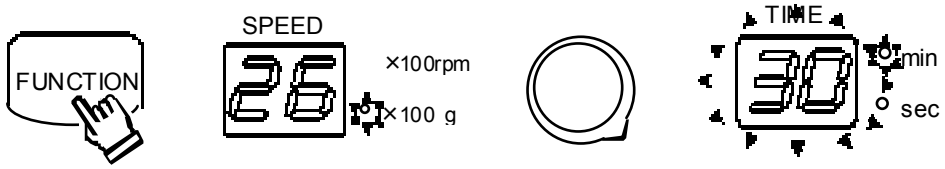
② When the 〈× 100g〉 lamp is off ····· Press the "SPEED/TIME" knob and the 〈× 100g〉 lamp turns on.
Proceed to the Procedure (3).



(3) Turn the "SPEED/TIME" knob to set to required centrifugal force reading.
Indications on the "SPEED" display are at 100 × g intervals.



(4) When continuing on to time setting, press the "FUNCTION" key.
The "SPEED" display stops flashing and the "TIME" display starts to flash.
(Timer setting status)



NOTE

- The centrifuge can be started with the speed on the "SPEED" display, even if the display of value is flashing.
- When you want to change the setting during the operation, press the "FUNCTION" key 2 times on the control panel after changing the setting, and the flashing of the display is stopped.
  The operation becomes shifted to the setting that have been changed.
- The setting order of the speed and the timer can be changed.
  ▶ Refer to page 3-15.

3－5. Setting the Timer

(1) Pressing the "FUNCTION" key 2 times, the "TIME" display flashes and indicates the current setting.
The timer is able to be set up.

(2) Pressing "SPEED/TIME" knob changes the settable range of centrifuging time as described below. Set to the range as required.
Factory default, the range is set minutes.

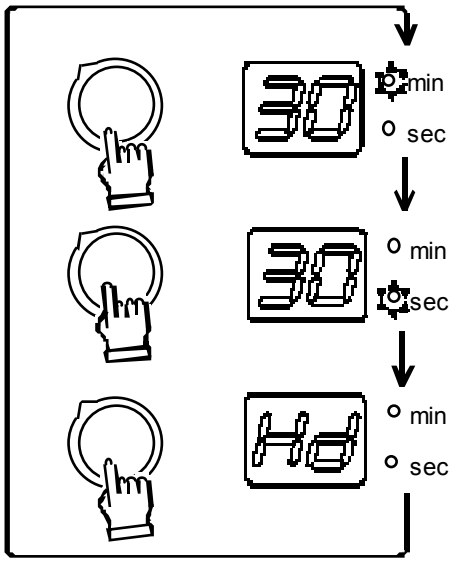
① Setting minutes

Settable range	1-99 minutes
Setting unit	1 minute

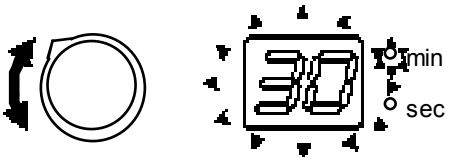
② Setting seconds

Settable range	1-99 seconds
Setting unit	1 second

③ HOLD
It will continually operate regardless of the timer. When set to hold, both "min" and "sec" lamp will be turn off.



(3) Turning the "SPEED/TIME" knob changes the indication on the display.
Set to the time required.



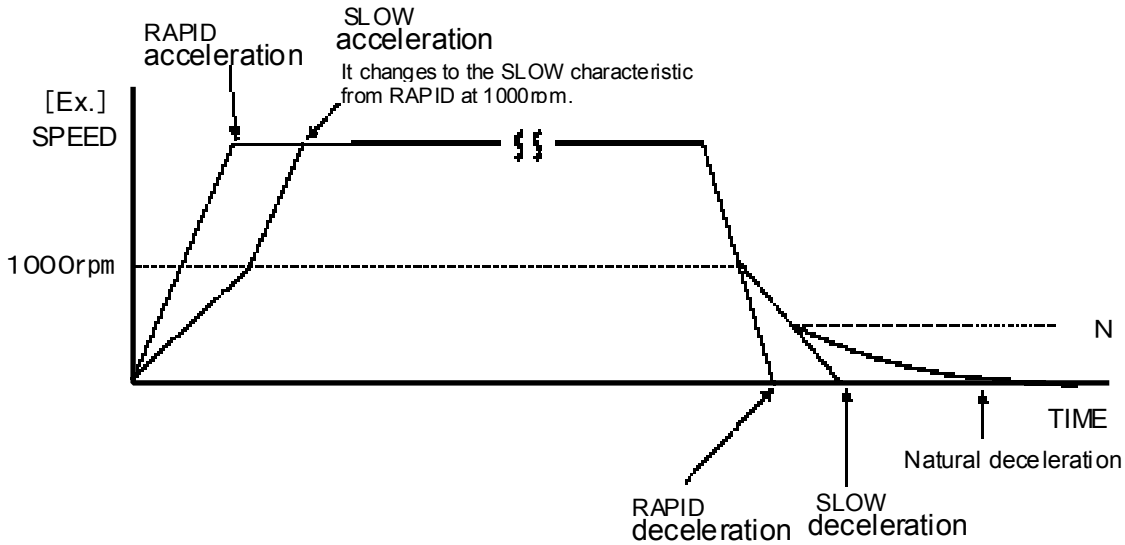
(4) Press "START" key on the control panel.
The operation will be started.
When started, the display will diminish and stop at point 0.

NOTE

- In case that the operation is stopped before the end of the period set by the timer and is resumed, the operation period after resumption is the remained period of the operation.
  If the "SPEED/TIME" knob is pressed before resumption of operation, the operation period returns to the originally set period.
- The centrifuge can be started at the time when the setting value is flashing at "TIME" display.
- When you want to change the setting during the operation, press the "FUNCTION" key on the control panel after changing the setting, and the flashing of the display is stopped.
  The operation becomes shifted to the setting that have been changed.
- The speed and the timer can be set in this sequence or vice versa.
  As for the change of the setting, please refer to page 3-15.

3－6. Setting the acceleration･deceleration

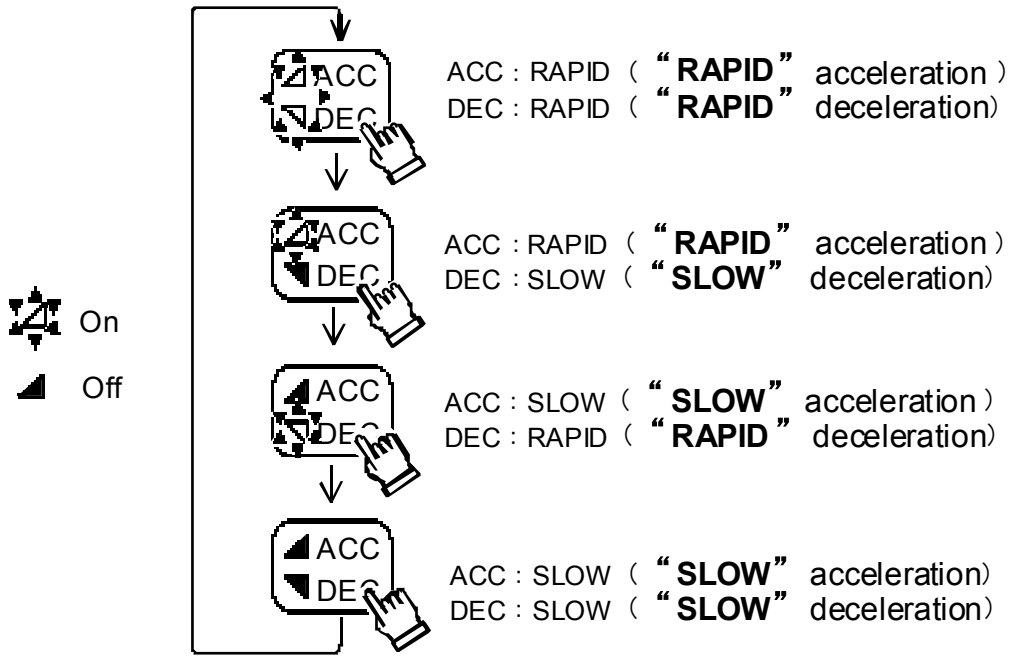
When blowing-up of samples is feared, adjust the acceleration and the deceleration setting by pressing the "ACC/DEC" key



NOTE

You can set the natural deceleration starting speed N.

▶ Refer to page 3-13.



3－7. Saving the Memory

Saving the setting value enables operation with the same setting value repeatedly.

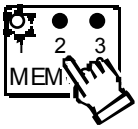
[1] Saving the Memory

(1) Set the respective parameters.
Refer to the following page for the setting method.

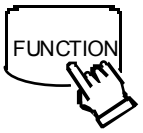
[3 － 4. Setting the speed] ▶ Refer to Page 3-6.
[3 － 5. Setting the timer] ▶ Refer to Page 3-8.
[3 － 6. Setting the acceleration・deceleration] ▶ Refer to Page 3-9.

(2) Pressing "FUNCTION" key, the setting is settled.

(3) Pressing "MEMORY" key, the lamp is lit, and choose the lamp number you want to save.



(4) Keep pressing "FUNCTION" key until the buzzer sounds. (About 3 seconds)

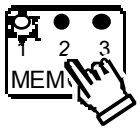


About 3 seconds

NOTE

The parameters necessary for operation (speed, RCF, time, acceleration / deceleration, etc.) can be stored as programs with MEMORY 1～3 keys.

(5) Stored memories can be easily recalled by pressing the appropriate memory selection key.



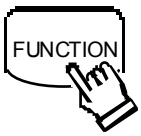
NOTE

Even if the power is turned off, the parameters set at the time of power off remain stored.
The last setting is displayed and can be operated.

[2] Memory cancellation

Pressing the "Function" key or the "ACC/DEC" key, the normal setting mode will be selected.

① Pressing the "Function" key.
The change for speed / centrifugal force or time.



② Pressing the "ACC/DEC" key.
The change for ACC and DEC.

3－8. Setting the Function

As for this product the following setting is produced.
Choose the item you want to set up, and press "SPEED/TIME" knob.
The page where the content is written is referred to.

NOTE

The memory lamp turns off temporarily, when you set the function while setting the memory operation in Model 2420. The lamp is lighted after the setting.

(1) Pressing the "SPEED/TIME" knob while holding down the "FUNCTION" key.

(2) The used number of times of the centrifuge is displayed.
［Ex.］186 times

(3) Setting the Rotation Radius
▶ Refer to Page 3-12.
［Ex.］146 mm

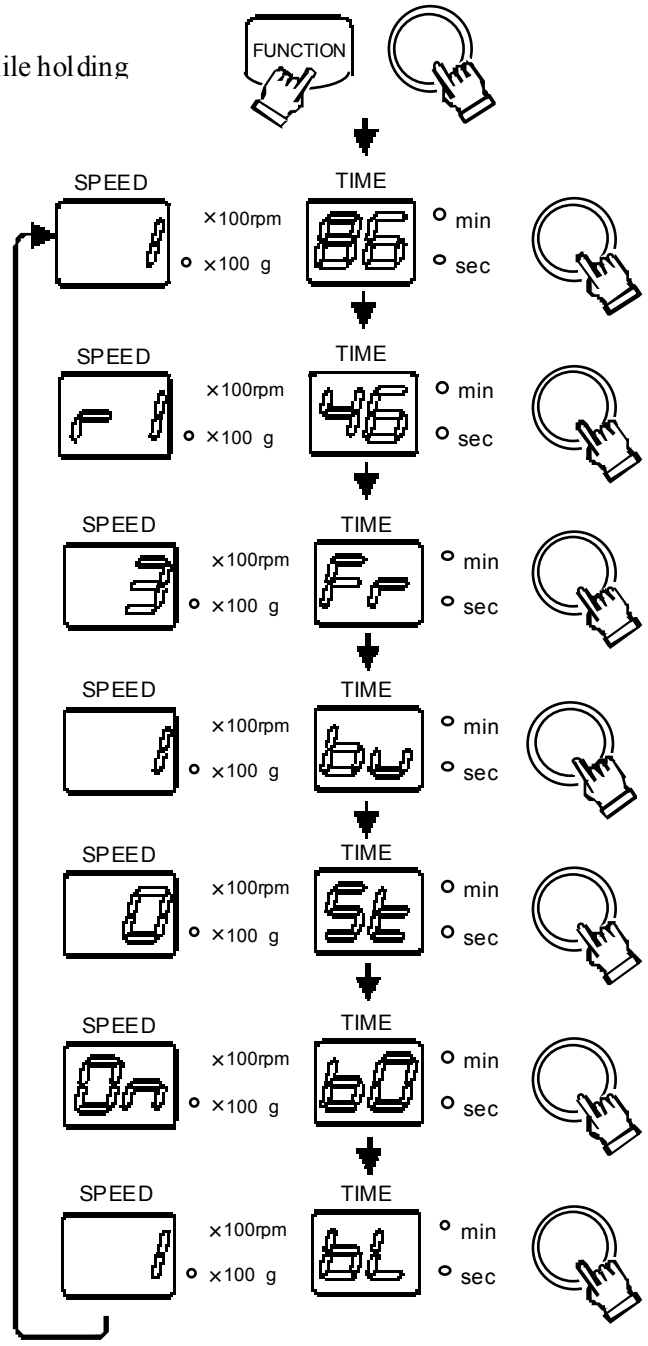
(4) Setting the "SLOW" deceleration.
▶ Refer to Page 3-13.
［Ex.］300rpm

(5) Setting the Sound that informs the end of the operation.
▶ Refer to Page 3-14.
［Ex.］1

(6) Reverse of setting order of the Speed and the Timer.
▶ Refer to Page 3-15.
［Ex.］0

(7) Setting the Reminder alarm.
▶ Refer to Page 3-16.
［Ex.］ON

(8) Setting the Indicators for the end of the operation.
▶ Refer to Page 3-17.
［Ex.］1



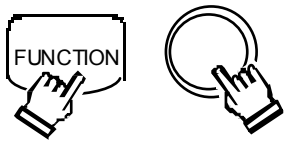
■ After setting any one of the above, please return the display to the previous indication of "SPEED" and "TIME".
To do above, press the "SPEED/TIME" knob while holding down the "FUNCTION" key.

[1] Setting the Rotation Radius

To obtain more accurate centrifugal force, adjust the rotation radius to that of the rotor buckets.

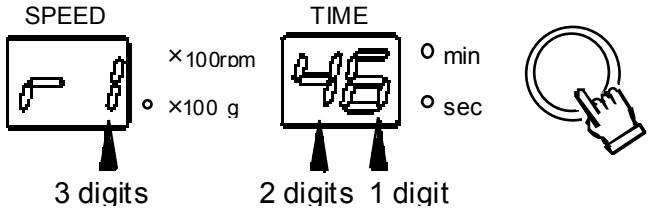
Factory default : 146 mm.

(1) Pressing the "SPEED/TIME" knob while holding down the "FUNCTION" key .
The used number of times of the centrifuge is displayed.

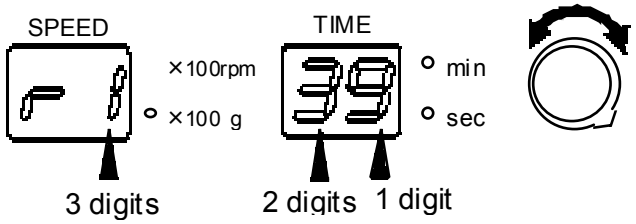


(2) Pressing the "SPEED/TIME" knob several times and let indicate " ⌐ " on the left side of the "SPEED" display.
The "SPEED" and "TIME" display indicates the current setting.
Unit : mm
▶ Refer to Page 3-11.

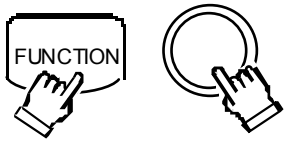
[Ex.] The rotation radius is 146 mm.



(3) Turn the "SPEED/TIME" knob to set to the rotation radius of the rotor bucket to be used for operation.
The range is set from 50 to 150 mm.



(4) Press the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The display returns to the previous Speed and Time indication after the setting (rotation radius) is saved.



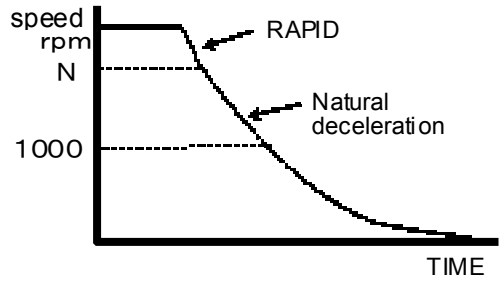
NOTE

The rotation radius can not be stored in the memory, when the power supply is turned off without returning the display to the previous indication.

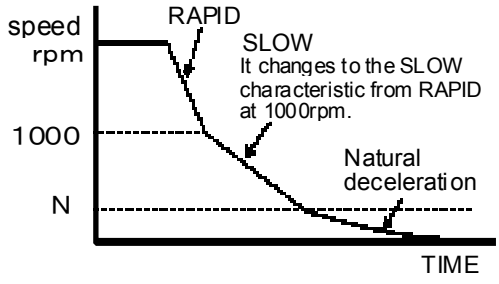
[2] Setting the "SLOW" deceleration

The characteristics have become as shown in the graph.
You can set the natural deceleration starting speed N by the following method.
Factory default, it is set as 0 rpm.
The setting range of "N" is from 0 to 4,000 rpm.

(A) N = 1,000 rpm or more



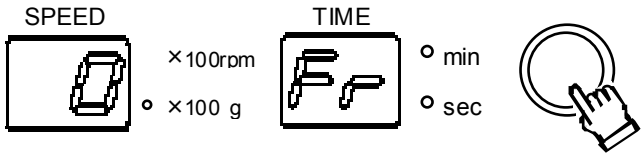
(B) N = 1,000 rpm or less



(1) Pressing the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The used number of times of the centrifuge is displayed.

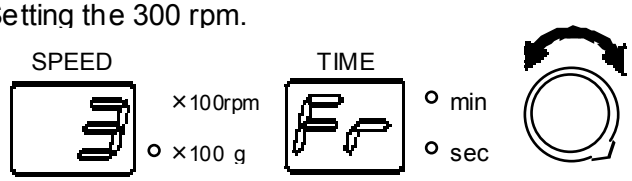
(2) Pressing the "SPEED/TIME" knob several times and let indicate " Fr "on the "TIME" display.
The "SPEED" display indicates the current setting of the natural deceleration speed.
Unit : rpm
▶ Refer to Page 3-11.

[Ex.] Setting is the 0 rpm.



(3) Turn the "SPEED/TIME" knob to set the natural deceleration speed.
The setting range of "N" is from 0 to 4,000 rpm.

[Ex.] Setting the 300 rpm.



(4) Press the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The display returns to the previous Speed and Time indication after the setting (Natural deceleration speed) is saved.

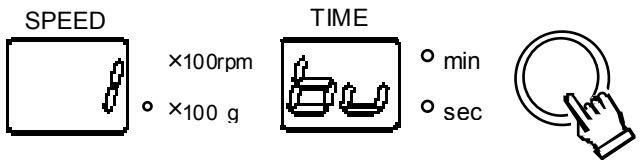
[3] Setting the Sound that informs the end of the operation

The "Sound that informs the end of the operation" can be selected from the 5 kinds + Sound none.
Use this function to identify each "Sound that informs the end of the operation" when you use more than one centrifuges.
Factory default : [1]

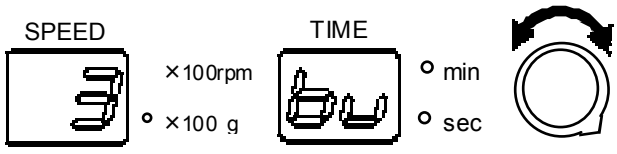
(1) Pressing the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The used number of times of the centrifuge is displayed.

(2) Pressing the "SPEED/TIME" knob several times and let indicate " ㄴㅁ″ on the "TIME" display. The "SPEED" display indicates the current setting of the sound that informs.
▶ Refer to Page 3-11.

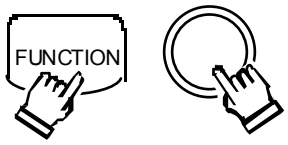
[Ex.] The "Sound that informs the end of the operation" 1.



(3) Turn the "SPEED/TIME" knob to change the "Sound that informs the end of the operation".
Pressing the "FUNCTION" key makes the selected buzzer sound once.
The "Sound that informs the end of the operation" can be selected from 1, 2,3, 4, 5 of 5 kinds + 0 (Sound none).



(4) Then, press the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The display returns to the previous Speed and Time indication after the setting (Sound that informs the end of the operation) is saved.



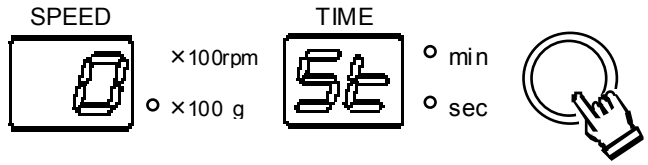
[4] Reverse of setting order of the Speed and the Timer

The setting order of the speed and the timer can be reversed.
This function is useful when you often operate the centrifuge by changing the timer only.
Factory default : [0]

(1) Pressing the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The used number of times of the centrifuge is displayed.

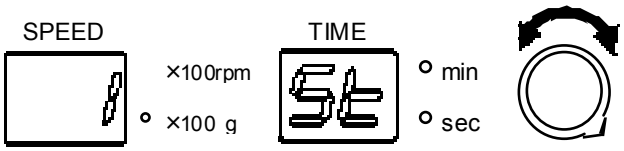
(2) Pressing the "SPEED/TIME" knob several times and let indicate " St " on the "TIME" display. The "SPEED" display indicates the current setting of the number (see the figure below). ▶ Refer to Page 3-11.

[Ex.] Numbers 0

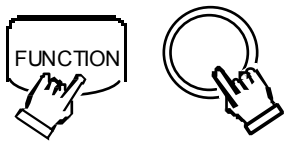


Numbers	Contents
0	「Speed / RCF」 → 「Timer」
1	「Timer」 → 「Speed / RCF」

(3) Turn the "SPEED/TIME" knob to change the number.



(4) Press the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The display returns to the previous Speed and Time indication after the setting (Numbers) is saved.



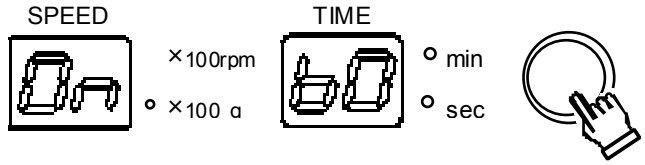
[5] Setting the Reminder alarm

The alarm reminds the user every minute when samples are left inside the centrifuge after completion of the operation.
The reminder alarm goes off when opening the lid or performing some operations.
Factory default : [ON]

(1) Pressing the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The used number of times of the centrifuge is displayed.

(2) Pressing the "SPEED/TIME" knob several times and let indicate " b 0 " on the "TIME" display.The "SPEED" display indicates the current setting of the reminder on or off. (see the figure below)
▶ Refer to Page 3-11.

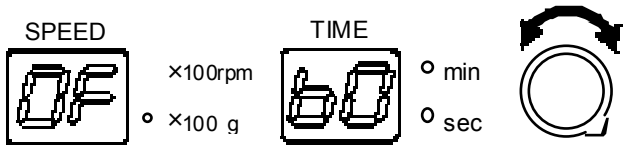
[Ex.] Reminder alarm : ON



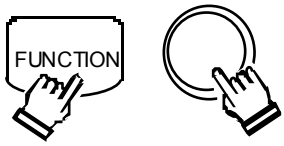
Reminder alarm	"SPEED" display.
O	On
×	oF

(3) Turn the "SPEED/TIME" knob to change the number.

[Ex.] Reminder alarm : OFF



(4) Press the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The display returns to the previous Speed and Time indication after the setting (reminder on or off) is saved.



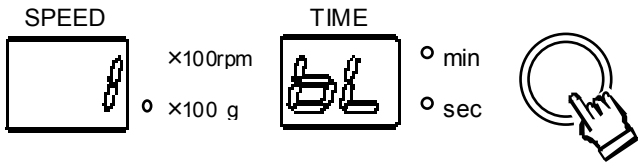
[6] Setting the Indicators for the end of the operation

Completion of the operation is indicated not only with an alarm but also with the "SPEED" and "TIME" displays.
The "Alarm Indicators" can be selected from the 5 kinds.
Factory default : [1] (see the figure below).

(1) Pressing the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The used number of times of the centrifuge is displayed.

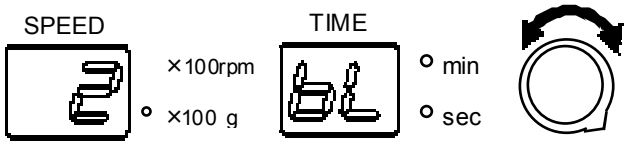
(2) Pressing the "SPEED/TIME" knob several times and let indicate " bL " on the "TIME" display. The "SPEED" display indicates the current setting of the number (see the figure below). ▶ Refer to Page 3-11.

[Ex.] Number : 1

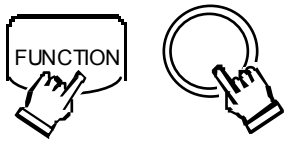


Numbers	"SPEED" and "TIME" display
0	After [Setting value] lights、[0] lights
1	After [Setting value] flashing、[0] flashing
2	[88] [88] flashing
3	[－－] [－－] flashing
4	[E] [nd] flashing

(3) Turn the "SPEED/TIME" knob to change the number.



(4) Press the "SPEED/TIME" knob while holding down the "FUNCTION" key.
The display returns to the previous Speed and Time indication after the setting (Numbers) is saved.



3－9. Calculating Centrifugal Force

You can readily calculate the centrifugal force by assigning the Rotation Radius and speed in the following equation:

[formula 3-1]

$$\text{Centrifugal force RCF}(\times g) = 11.18 \times \left(\frac{\text{Speed N (rpm)}}{1000}\right)^2 \times \text{Rotation Radius R(cm)}$$

Please refer to the Nomograph for Centrifugal Force Calculation at the last page of this manual.

NOTE

As for rotation radius, please refer the page 6-4, 6-5, 6-10 and 6-12. The maximum centrifugal force being indicated in the said pages is calculate by substituting the maximum radius of gyration of the rotor for the radius of gyration of each rotor (cm) and by rounding the first digit above the decimal point of the calculation result.

By setting the rotation radius, an accurate speed and centrifugal force can be switched. Factory default at the time of delivery is 14.6 cm.

▶ Refer to page 3-12.

3－10. Allowable load and Reduced maximum speed

⚠WARNING

Do not exceed the maximum speed and the allowable load of rotor and bucket.

An excessive speed or overload may cause a damage to the rotor, bucket and the centrifuge.

If the load exceeds the limit, reduce the maximum speed as shown in the formula 3-2 and set the actual speed below the reduced maximum speed.

[formula 3-2]

$$\text{Reduced maximum speed (rpm)} = \text{Maximum speed (rpm)} \times \sqrt{\frac{\text{Allowable load (gram)}}{\text{Actual load (gram)}}}$$

(1) When the gravity of sample is 1.2 or higher or when a special tube is used, check the allowable load of the rotor and bucket.

(2) Regarding allowable load on rotors and buckets at the maximum speed refer to the appropriate Specification Table for rotor in use.

(3) The allowable load includes the weight of sample, cushions, adaptors, tubes, caps, and racks. (The weight of bucket is not included in the allowable load.)

Section 4 Service

4－1. Daily Inspection

⚠WARNING

If any abnormality is found during routine daily inspections, discontinue centrifuge operation, use the "POWER" switch to turn the machine OFF, disconnect the power cable, attach "DO NOT USE" labels to the rotor and the outside of the centrifuge, and contact your nearest dealer to request a centrifuge inspection before resuming operation of the equipment.
If the centrifuge is used after discovering any abnormality, an accident could occur, possibly leading to serious damage or accidents involving physical injury.

Checkpoint	Action taken
Check whether the rotor knob and rotor locking nut are properly tight.	Retighten, if either of these is loose. For details, refer to "Mounting the Rotor" in the rotor instruction manual. ▶ Refer to Section 6.
To inspect, mount buckets on the swinging bucket rotor when it is stopped, and lift up the buckets manually.	If the buckets do not move smoothly and freely, clean the bucket grooves and trunnion pins of the rotor yoke using alcohol. Contact your local dealer and make an appointment for an authorized inspection if these parts fail to operate smoothly even after lubricant has been applied. ▶ Refer to Page 4-5.
Check carefully for any cracks, evidence of corrosion, rust or deformation on the rotor and buckets.	Do not use the rotor or buckets if any cracks, corrosion, rust or deformations are found. Contact your local dealer for an inspection.
Check that no foreign material or water is present in the chamber.	Remove any foreign material or water before operating the centrifuge.
Check that the lid is hook.	If the lid lock does not work, discontinue operation of the centrifuge. Contact your nearest dealer for a centrifuge inspection.
Check that the screws fixing the lid hinges are not loose.	If the screws fixing the lid hinge are loose or have been removed, the lid may come off when the buckets are thrown off and the broken pieces may cause injury to the persons in the vicinity of the centrifuge. If the lid hinge is not fixed firmly, stop centrifuge operation. Stop operation promptly and contact your local dealer for inspection.
Check the nut of the trunnion pin (RMP-23) is not loosened.	If the trunnion pin is loosened, contact your local dealer for inspection.
Check that the grounding wire is correctly connected.	▶ Refer to Page 2-3.
Check that all knobs, displays, lamps and switches operate correctly.	If any do not operate correctly, contact your local dealer for an inspection. ▶ Refer to Page 1-1 and 1-2.
Check that the centrifuge is placed horizontally.	▶ Refer to page 2-1.

4－2. Monthly Inspections

[1] Inspect the rotor

⚠WARNING

Perform a monthly careful inspection of the rotor appearance. Check for any deformation or damage, including the interior and bottom of the holes. If any abnormality whatsoever is found, there may be significant damage or corrosion of the rotor that could lead to serious damage or accidents involving physical injury. Stop operation at once, put "DO NOT USE" labels on the rotor and centrifuge lid, and contact your local dealer to arrange for authorized service.

[2] Clean the rotor and buckets

Remove the rotor from the shaft, and clean it.
▶ Refer to Page 4-3.

[3] Clean the chamber interior

▶ Refer to Page 4-3.

4－3. Annual Inspection

Annual Inspection (fee required)

For the following inspection items, please call your local dealer and set up an appointment for a periodical inspection.

Motor	Speed control
Rotor and bucket	Imbalance
lid	Electric current
Chamber	Insulation
Speed meter	Install the centrifuge
Timer	

4－4. Cleaning and Sterilization

⚠WARNING

Consult with your nearest dealer prior to attempting any cleaning procedure for the rotor, buckets, or tube rack that is not specifically recommended in this manual. Certain cleaning methods or cleaning agents may cause corrosion and then breakage leading to serious damage or accidents involving physical injury.

[1] Cleaning the chamber interior

The chamber is made of stainless steel (SUS304) but may rust if sample spillage containing salt (NaCl) or chlorinated chemicals (Cl) is allowed to remain.
After using the centrifuge, follow the method below (1) when wiping the inside of the chamber and cleaning the surfaces.

(1) Cleaning and rust prevention

Cleaning the chamber interior according to the following procedure will help prevent rust.

1) Wipe off any dirt or residue using a cloth moistened with a small quantity of a neutral detergent.
2) Wipe away any detergent residue using a cloth dampened with water, and then dry the inside of the chamber.
3) To prevent rust, we recommend the use of common anti-rust agents (such as CRC-556) only if such will not affect the samples being centrifuged.
   Wipe the dirt off using a cloth containing a small quantity of neutral detergent.

(2) If rust is present

Superficial rust can be removed by using a mild solution of sodium bicarbonate (NaHCO3, bicarbonate of soda, baking soda).

1) Moisten a paper towel with a little water, apply some bicarbonate of soda, and then rub the area where rusting has occurred.
2) After removing the rust with the bicarbonate of soda, follow the above procedure (1) and clean the chamber interior using a neutral detergent followed by a thorough wiping with plain water. Make sure that such cleaning is especially thorough, so that all traces of the bicarbonate of soda are removed.

[NOTE]

Under no circumstances should any rust inside the chamber be removed by using sandpaper or abrasive agents, since if the interior surfaces are scratched, this will only increase the likelihood of additional rust developing.

Contd. on next page.

[2] Cleaning the rotor, buckets and tube rack

⚠CAUTION

Do not use detergents exceeding a pH range of 5 - 8, or chlorinated detergents normally used for washing.
Corrosion may damage the rotor, bucket, or tube rack, resulting in damage to the centrifuge that may lead to serious additional damage or accidents involving physical injury.

NOTE

Do not allow any spilt samples to remain on any surfaces, otherwise rust or corrosion may occur. Also, if sample spillage is left between the rotor and shaft, later detachment of the rotor may become problematic.

1) If sample spillage has occurred, remove the rotor, buckets, and tube rack from the centrifuge, and wash the affected items with a neutral detergent and warm water.
Then rinse the items with the distilled water and thoroughly dry them before use.

2) If water has accumulated inside the rotor, place the rotor with its bottom side up and allow it to dry completely.

3) If a sample has spilled onto the drive shaft, wipe it off using a cloth moistened with a small amount of a neutral detergent and then clean away all detergent traces using a cloth moistened with water. Then, dry the surfaces completely before using the machine.

[3] Sterilization of rotor, buckets and tube rack

⚠WARNING

Do not heat the rotor, buckets, or tube rack above 100 ℃ for sterilization or disinfection purposes.
Also. do not use an autoclave for dry heat sterilization. since excessive heat may deleteriously affect the strength of the rotor, buckets, or tube rack. resulting in breakage of the rotor. buckets. or tube rack. causing serious damage or accidents involving physical injury.
Yet, You can conduct up to 50 times of autoclave sterilizations of the RMP-23 rotor and bucket at 121 ℃ and 100 times of autoclave sterilizations of the RS-1004 rotor and bucket at 121 ℃.

To disinfect the rotor, buckets, or tube rack, a 70 % ethanol solution, or ultraviolet radiation, is recommended.

4－5. Greasing

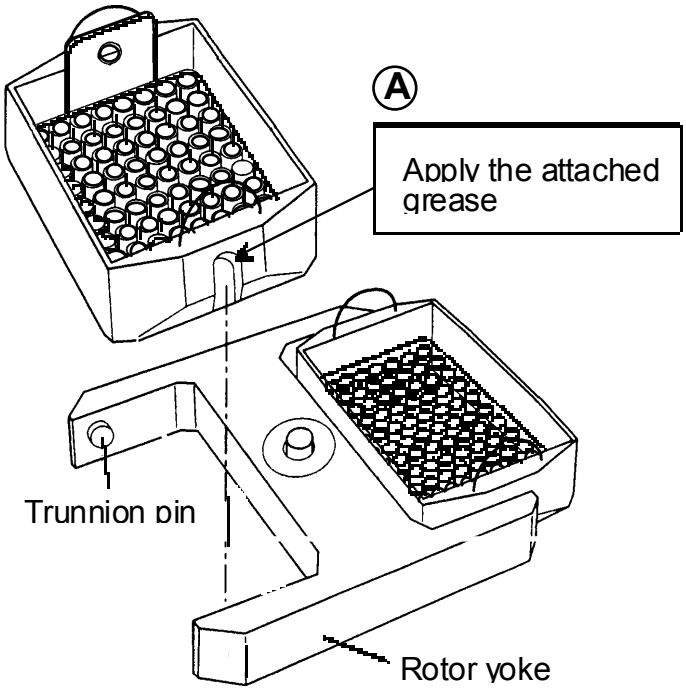
⚠CAUTION

Be careful to maintain lubrication by ensuring that a proper amount of grease is present in all bucket grooves (section "A" in the schematic diagram below). A lack of grease may allow violent vibration to occur, resulting in damage to the centrifuge.

NOTE

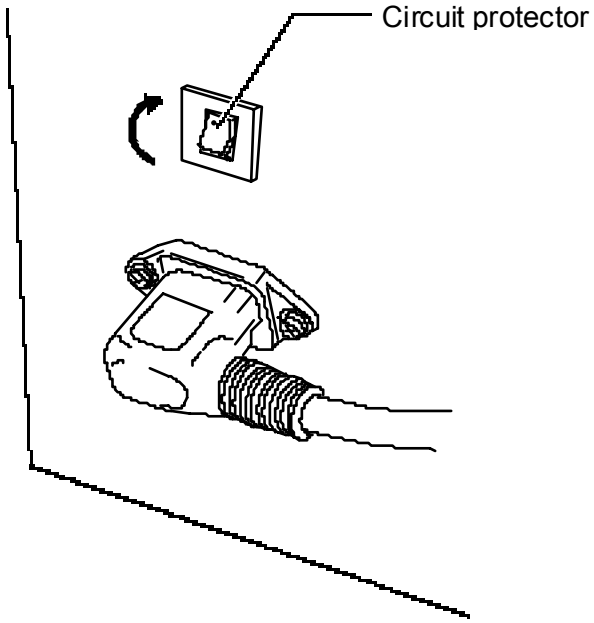
1) If the buckets do not swing up smoothly as the rotor is spun up to speed, apply the attached grease to the section A shown in sketch below. The buckets should then swing up smoothly.
2) Wipe off any dirt or congealed material before applying fresh grease, using alcohol or acetone.
3) If the buckets do not swing up properly after applying the grease, contact your local dealer for an inspection.
4) When the provided grease is used up, purchase replacement grease of the following code number from your nearest local dealer.

Rotor	Grease code No.
RMP-23 RS-1004	S70284



4－6. Inspection of Circuit Protector

The circuit protector is automatically activated when the electric circuit failure or overcurrent occur.
In such a case, the white portion of the circuit protector, located at the bottom left on the rear side of the centrifuge, will stick out.



Recovery procedure is as follows :

(1) Turn off the power switch.

(2) After the rotor stops completely, open the lid and check the rotor, following the procedure given in [3 - 3. Opening and Closing the lid 2. Opening the lid during power failure] on Page 3 - 4.

(3) Close the lid , and then push the sticking out white portion until it becomes unseen.

(4) Turn on the power switch.

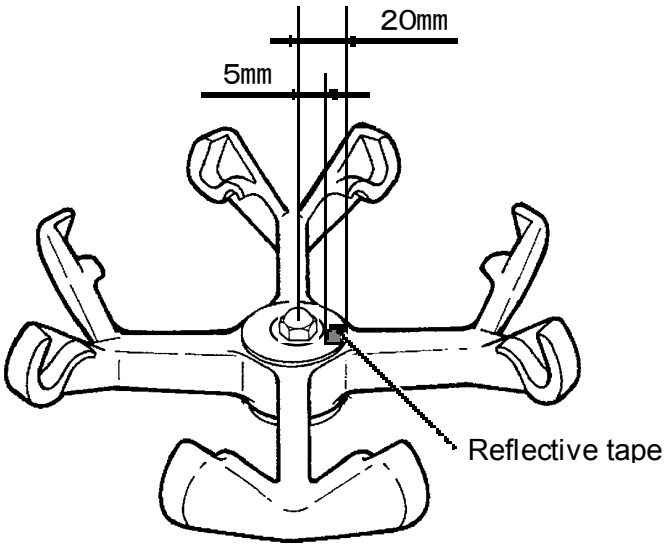
(5) Re - start operation and see if it works.

If the circuit protector is activated again, contact your local dealer.

4－7. Using the Photoelectric Tachometer Port

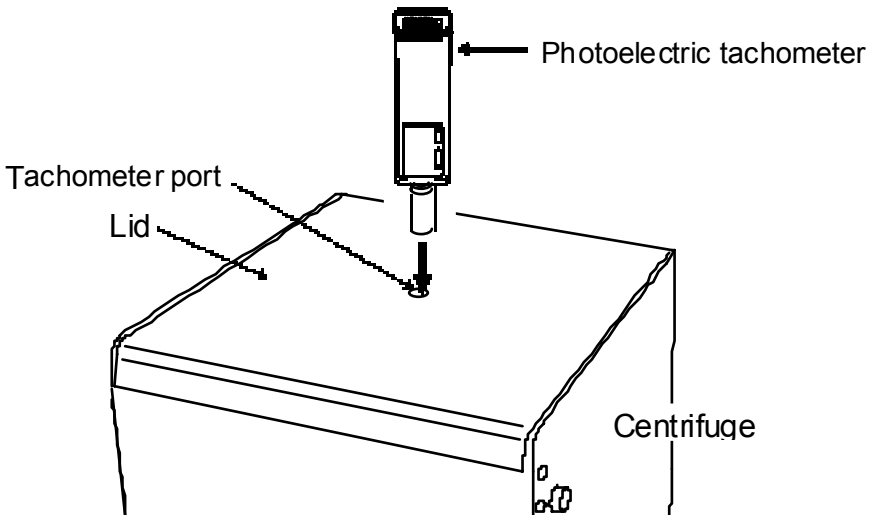
A tachometer port (transparent window) is provided at the top of the lid. Through the tachometer port, the actual rate of rotation can be measured, using a photoelectric tachometer.

(1) When using a photoelectric tachometer, place a piece of reflective tape 5 - 20mm away from the center of the rotor.



(2) Mount the rotor on the drive shaft.
▶ Refer to Section 6.

(3) After turning the power ON, set the photoelectric tachometer so that its tip is right above the tachometer port on the lid. The photoelectric tachometer can then measure the actual rotation rate.



Do not apply force to the tachometer port window from inside the lid.

4－8. Spare Parts Supply

NOTE

Spare parts (parts necessary to the maintenance of equipment functions) will be available for seven (7) years after production of the particular product is discontinued. We therefore beg your indulgence and recommend that you be prepared for some situations in which certain repairs are impossible due to a lack of spare parts.

4－9. Manufacturer requirements at Repair or Maintenance

We cannot repair or inspect a centrifuge if it has not been properly washed or sterilized beforehand, or if it has been used in an RI facility or a facility operating at a level higher than P2. Please ensure that each machine has been properly washed and sterilized before offering it for repair or inspection.

[1] Required information when submitting an inquiry

Necessary information	Note
1. Model	2420
2. Serial number	No._____ See the name label at the left side panel of centrifuge.
3. Trouble	Provide a description of the trouble as detailed as possible.

[2] Required information that must be attached to the centrifuge in the form of a note

(1) If you have pertinent information on your handling of biohazards, fill out the items below, and affix this information to the centrifuge.

1. Environment where the centrifuge is used.
2. Sample
3. Required measures against the biohazard.

(2) Please attach a "Contaminant Elimination Certificate" to the centrifuge.
▶ Refer to Page 4-9 and 4-10.

4－10. Product Preparation When Returning Units for Repair or for Other Reasons

[1] Remove any contaminants from units or items that will be returned for servicing

Prior to sending back our products (including accessories) for repair or for other reasons, be sure to remove any and all contaminants.

[2] Attach a Contaminant Elimination Certificate

To eliminate possibly harmful contaminants, the user must take appropriate action on his or her initiative. Fill out a "Contaminant Elimination Certificate" as shown on page 4-11, and attach it to the item to be returned.

[Caution]

"Contaminant" means radioactive materials, poisonous materials, contagious pathogens, and so on. The preparatory procedure to eliminate all traces of such contaminants therefore varies depending on the respective materials. Please take appropriate action to prevent any possible hazard to personnel who will be handing the machine, equipment or parts.

[3] Equipment contamination elimination goal

The elimination of contaminants from the equipment is aimed to safeguard the persons who will inspect and repair the returned products at our facilities.

[4] If a Contaminant Elimination Certificate is not attached:

If a "Contaminant Elimination Certificate" is not attached to the returned products we receive, we will contact the person in charge to confirm the details.

If we cannot confirm that potentially hazardous contaminants have been properly eliminated, and we find that we cannot adequately deal with such matters ourselves, we may return the products to the customer without taking further action.

[5] Contaminant elimination fee

If we are forced to perform the work of eliminating contaminants, we may request that you pay a fee. Please note this stipulation beforehand.

Please make a copy of this page and fill out the relevant details.

Contaminant Elimination Certificate

Date : , ,

Name:

Company / Institute:

Department:

Tel: Fax:

Address:

We hereby certify that contaminant elimination for this equipment has been performed as follows:

Type of unit: Serial No.

Type of unit: Serial No.

Accessories :

Date when contamination elimination was carried out.

Date: , ,

Contaminants:

Method used:

Dealer notification:

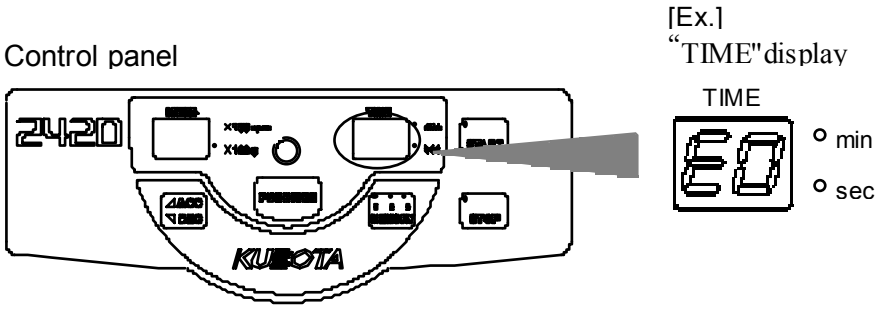
Signature:

Section 5 Troubleshooting

5－1. Alarm Indicators

(1) When trouble occurs during operation, the "TIME" display flashes to indicate the alarm.

(2) When any of the alarms become activated during operation (when the rotor is spinning), the rotor immediately decelerates and stops.



NOTE

The equipment is inoperative while any of the alarm indicators is turned on.

Alarm Indicators	Checkpoint	Action taken
E0	Setting speed alarm An error occurs immediately after the "START" key is pressed when the speed is more than 4,000 rpm (this may happen when centrifugal force after changing rotation radius is changed to speed).	Pressing the "START" key makes the centrifuge auto-correct the speed to 4,000 rpm.

Cont'd. on next page.

Alarm Indicators	Checkpoint	Action taken
C1 C2 C3 C4 C5	Time alarm for rotor inspection Because the inspection time has arrived, the alarm is displayed. 1-5 represents the level of the number of times of rotor use. As for the details, please refer to the following.	The inspection time for the rotor has arrived. Contact your nearest dealer for inspection of the rotor and bucket.

"Alarm Indicators" and "Number of times of rotor use" at the time of rotor inspection

Each "Alarm Indicator" is displayed at the time when the number of times of rotor use reaches the figures shown below.

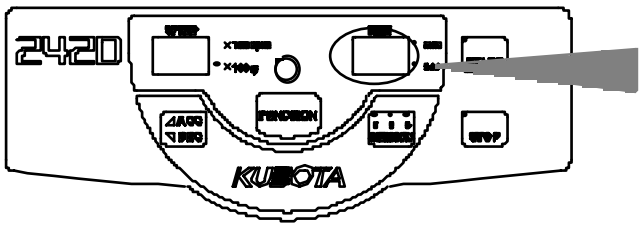
Alarm Indicators	Number of times of rotor use at the time of the alarm indicators
C1	50,000～50,050
C2	80,000～80,050
C3	100,000～109,999
C4	110,000～119,999
C5	From 120,000

5－2. Error Indicators

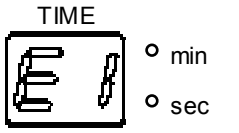
(1) When trouble occurs during operation, the "TIME" display flashes to show the error. The error indicators are mentioned in the table below.

(2) When any of the error indicators turn on during operation (when the rotor is spinning), the rotor immediately decelerates and stops.

Control panel



[Ex.] "TIME"display



NOTE

The equipment is inoperative while any of the error indicators is turned on.

Error Indicators	Checkpoint	Action taken
E1	Imbalance error This indicator flashes and the rotor stops rotation when excessive vibration is detected.	① Balance the load (samples or bucket). ② Remove dust and dirt from the sliding surface and apply grease so that the bucket on the swing rotor swings up smoothly. Contact your local dealer for inspection when this error continues to flash even after taking the above measures.
E2	Lid open error This indicator lights when the lid is open.	Close the lid completely. When the error recurs, contact your nearest dealer for inspection.
E3	Inverter Error This indicator flashes when abnormal signal comes out from the inverter.	After the rotor stops spinning, turn off power supply once and turn on the power after about 30 seconds. When the error recurs, contact your nearest dealer for inspection.

Cont'd. on next page.

Error Indicators	Checkpoint	Action taken
E4	Speed sensor error This indicator flashes when the self-inspection function detects the fault or abnormality in the speed sensor.	After the rotor stops spinning, turn off power supply once and turn on the power after about 30 seconds. When the error recurs, contact your nearest dealer for inspection.
E6	Over speed error Flashes to stop the rotation when the maximum speed of the corresponding rotor is exceeded.	Contact your local dealer for inspection when this error continues to flash.
E7	Speed error This code appears when the equipment did not start its operation within 5 seconds after the "START" key was pressed by such causes as electric circuit failures.	After the rotor stops spinning, turn off the power supply once and turn on the power after about 30 seconds. If the error recurs, contact your nearest dealer for inspection.

5 – 3. Troubleshooting

Problem	Checkpoint	Action taken
1. The "STOP" key lamp does not lit even if the "POWER" switch is turned on.	Is the power plug disconnected from the power outlet?	Insert the power plug into the socket.
	Is power supplied to the socket or knife switch ?	Inspect the power supply.
	Is the power supply voltage correct? (Note1)	Use a power supply in the correct voltage range.
2. The power is turned off immediately even if the "POWER" switch is turned on.	Is the power supply voltage correct? (Note1)	Use a power supply in the correct voltage range.
3. The lid does not open even if the "OPEN" button is pushed.	Is the "POWER" switch turn on?	Pull up the "POWER" switch to turn the power on.
	Is the <STOP> lamp lit or flashing?	Wait until the rotor is completely stopped.
	Does it open when the power switch is turned off and turned on once again in 10 seconds?	Check if an imperfect contact is not occurring with the power cable connection.
4. The motor does not spin.	Is the "POWER" switch turn on?	Pull up the "POWER" switch to turn the power on.
	Is the <STOP> lamp lit?	Go back to Problem 1. & 2. and check the power supply.
	Is the alarm <E1, E2, E3, E4, E6,, E7> flashing on the "TIME" display ?	▶ Refer to pages 5-1, 5-3 and 5-4.
	Is the lid closing? (Note 2)	Close the lid firmly.
5. The speed does not reach the set value even if the knob is turned.	Is the power supply voltage low? (Note 1)	Use a power supply in the correct voltage range.

Note 1: Read [2-4. Power Requirements] on page 2-3.

Note 2: Read [3-3. Opening and Closing the lid] on page 3-4.

Problem	Checkpoint	Action taken
6. Excessive vibration. or the error <E1.> lit.	Are buckets and tubes correctly distributed? (Note 3)	Distribute buckets and tubes correctly.When the error recurs, contact your nearest dealer for inspection.
	Do the buckets swing smoothly?	Spray lubricant to buckets and trunnion pins.
	Are the rotor knob or the rotor locking nut loose? (Note 3)	Fasten the rotor knob or the rotor locking nut securely.
	Check if the rotor is not loose.	Fasten the rotor locking bolt or the rotor locking nut securely.
7. An abnormal noise sounds.	Are buckets and tubes correctly distributed? (Note 3)	Distribute buckets and tubes correctly.
	Do the buckets swing smoothly?	Spray lubricant to buckets and trunnion pins.

Note 1: Read [2-4. Power Requirements] on page 2-2.
3: Read section 6 [Rotor] on page 6-1.

If the error still remains even after the troubleshooting is made and the action has been taken, or in case the following phenomena are occurring, stop the operation.

- The rotor or metal tubes has been found to be damaged or corroded.
- A burnt smell comes out of the equipment.
- You receive a minor electrification when you touch the equipment body by a naked hand.
- Some other abnormality or failure has been found occurring.

NOTE

When operation centrifuge is interrupted by some abnormality, failure or for repairs, always turn off the "POWER" switch and attach "DO NOT USE" stickers to the rotor and the centrifuge before contacting your nearest dealer.

Section 6 Rotor

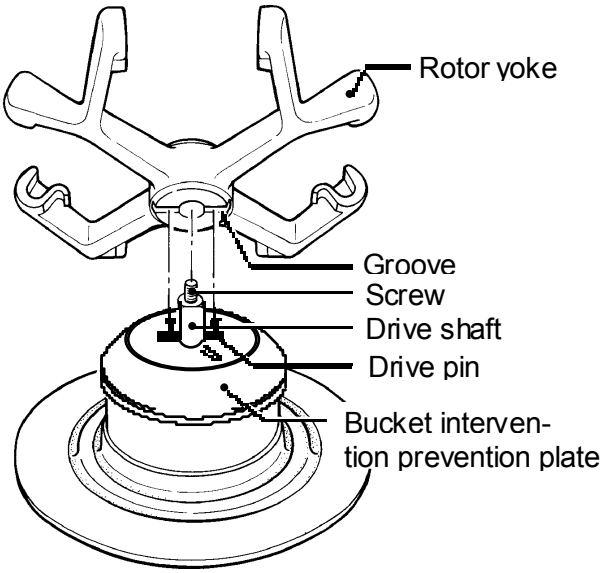
6－1. Mounting RS-240 Rotor

When you purchase the centrifuge and rotor together, the rotor will be in the state of being mounted on the centrifuge.
When replacing the rotor or when the rotor is removed for some reason, refer to the mounting procedure in the manual for each rotor.

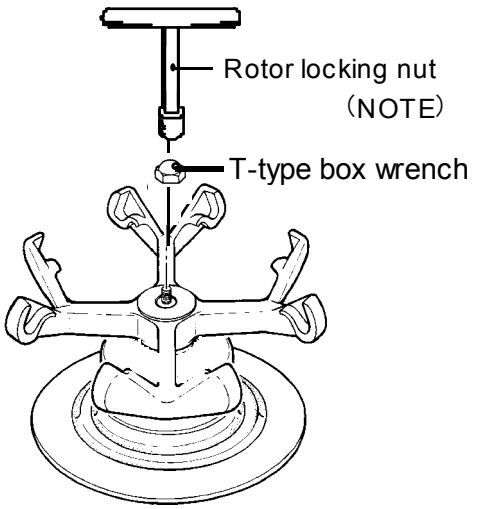
⚠CAUTION

Make sure that the rotor yoke is firmly fastened to the drive shaft with the rotor locking nut.
Since the rotor is not fastened onto the shaft when these parts are loose,excessive vibrations will occur and damage the equipment and the rotor may fly off inflicting physical injury.

1. Confirm that the " Bucket intervention prevention plate" is mounted on the drive shaft.
2. To install the rotors, match the rotor groove with the pin of the drive shaft.
3. Fix the rotor by tightening the rotor locking nut. Rotate the nut clockwise using the T-type box wrench etc.
4. After installation of the rotor, hold the rotor yoke and attempt to move it up and down to ensure that there is no play.



Do not start the operation when the rotor locking nut is removed.



If the drive pin of the drive shaft is not set in the groove of the rotor bottom surface, the bucket intervention prevention plate is not be fixed and moves up and down.
In such a case, re-install the rotor.

(NOTE)
T-type box wrench will be attached to the rotor as standard accessary, when the second rotor is purchased.

6－2. Mounting RS-1004 Rotor

⚠CAUTION

Make sure that the rotor yoke is firmly fastened to the drive shaft with the rotor knob.

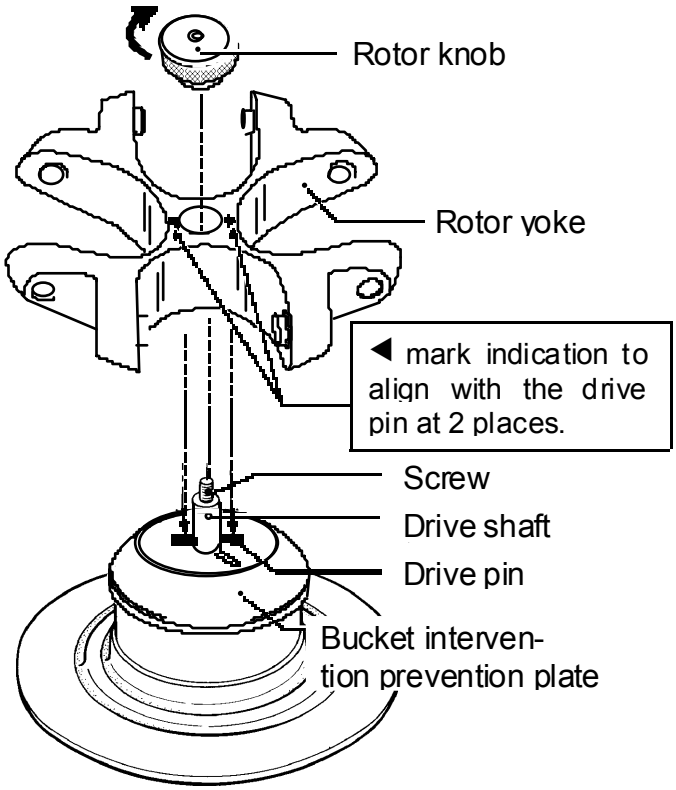
Since the rotor is not fastened onto the shaft when these parts are loose,excessive vibrations will occur and damage the equipment and the rotor may fly off inflicting physical injury.

1. Confirm that the "Bucket intervention prevention plate" is mounted on the drive shaft.

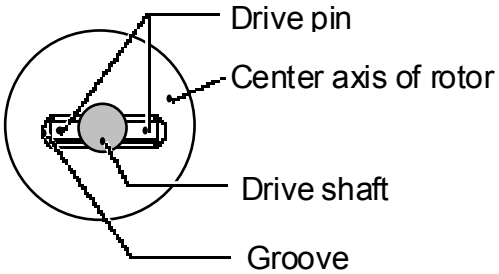
2. To install the rotors, match the pin ◀ mark of the rotor with the drive pin of the drive shaft.

3. Fix the rotor yoke by rotor knob, and then tighten by turning the rotor knob clockwise.

4. After installation of the rotor, hold the rotor yoke and attempt to move it up and down to ensure that there is no play.



Do not start it in the condition that the rotor knob got loose.



If the position of the pin ◀ mark of the rotor does not align with the drive pin, the groove at the bottom surface of the rotor and drive pin do not fit.
In such a case, reinstall the rotor.

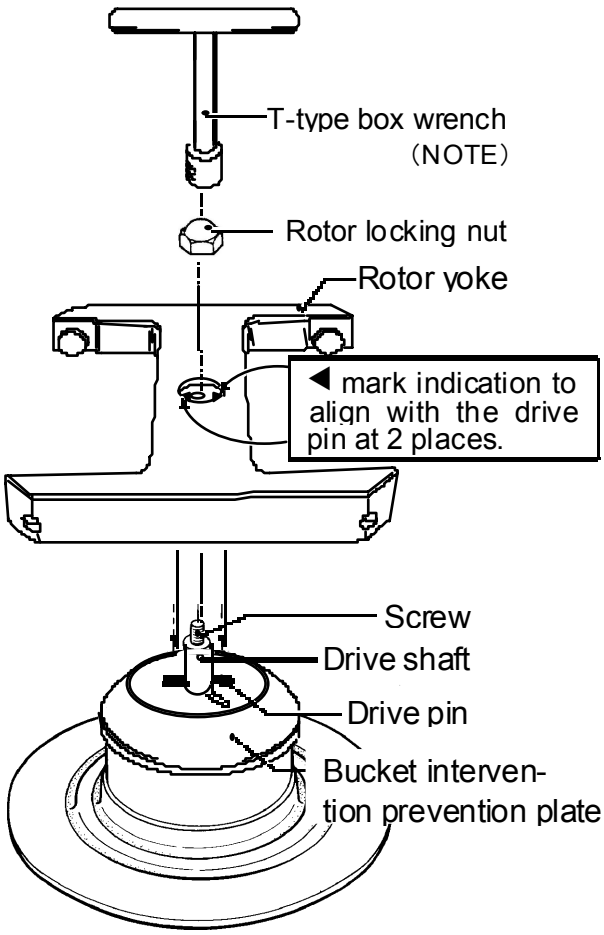
6－3. Mounting RMP-23 Rotor

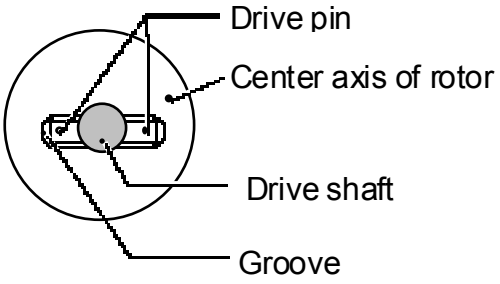
⚠CAUTION

Make sure that the rotor yoke is firmly fastened to the drive shaft with the rotor locking nut.

Since the rotor is not fastened onto the shaft when these parts are loose,excessive vibrations will occur and damage the equipment and the rotor may fly off inflicting physical injury.

1. Confirm that the "Bucket intervention prevention plate" is mounted on the drive shaft.
2. To install the rotors, match the pin ◀ mark of the rotor with the pin of the drive shaft.
3. Fix the rotor by tightening the rotor locking nut. Rotate the nut clockwise using the T-type box wrench etc.
4. After installation of the rotor, hold the rotor yoke and attempt to move it up and down to ensure that there is no play.





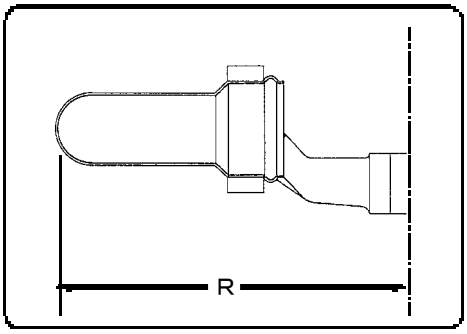
Do not start the operation when the rotor locking nut is removed.

(NOTE)
T-type box wrench will be attached to the rotor as standard accessary, when the second rotor is purchased.

If the drive pin of the drive shaft is not set in the groove of the rotor bottom surface, the bucket intervention prevention plate is not be fixed and moves up and down.
In such a case, re-install the rotor.

6－4. RS-240 Swinging Bucket Rotor

[1] Specification



Maximum Speed (rpm)	4,000
Maximum R C F (× g) *1	2,610
Maximum Weight (kg)	1.6

Nominal Capacity ml	Number of Tube	Tubes Material *2	Tube Sizes Dia. × Length mm	Form *3	Tubes Code No.	Allowable Speed rpm	R C F × g	Bucket Code No.	Tube rack / Adaptor Code No.	Cushion Code No.	Maximum Radius R cm	Allowable load gram *5
2	48	PP	9.5～11 × 36～60	C R	1.5～2ml micro tube	4,000	1,950	053-5040 Carrier	055-4830	024-1880	10.9	50
6	40	GL PL	12.5～13.3 × 36～80	C R	—		1.970	053-5030 Carrier	055-4820		11.0	100
5	24	GL PL	12.5～13.3 × 46～105	R	Becton, Dickinson Hemolyse tube		2,430	053-5850 Carrier	055-0290	024-1890	13.6	120
10					052-6320							
10／15	4	GL	15～17.2 × 86～110	C R	052-6360 052-6330		2,500	053-4990	055-7400	024-1400	14.0	100
15	4						2,540	053-4910	—		14.2	30
15	4	PL	17 × 121	C	Conical tubes FALCON etc.		2,580	053-4910 *4		Use bucket without cushion.	14.4	
10／15	8	GL	15～17.2 × 86～110	C R	VENOJECT II etc. Hemolyse tube 052-6360 052-6330		2,520	053-4900		024-1400	14.1	60
15	8	PL	17 × 121	C	Conical tubes FALCON etc.		2,580	053-4900 *4		Use bucket without cushion.	14.4	

*1 The Max. RCF is the calculation value of the Max. speed for the rotation radius of 14.6cm.
The value of the RCF that is indicated to the display is showing the value that cut the lower 2 digits.
▶ Refer to Page 3-12.

*2 PP : Polypropylene GL : Pyrex Glass PL : Plastic

*3 C : Conical R : Round type

*4 Use a bucket after removing cushion.

*5 Allowable load per bucket.
This load includes the weight of the sample, adaptor, tube rack, cushion, tube, cap, etc.
The weight of bucket is not included in the allowable load.

Nominal Capacity ml	Number of Tube	Tubes Material *2	Tube Sizes Dia. × Length mm	Form *3	Tubes Code No.	Allowable Speed rpm	R C F × g	Bucket Code No.	Tube rack / Adaptor Code No.	Cushion Code No.	Maximum Radius R cm	Allowable load gram *5
10／15	16	GL	15～17.2 × 86～110	C R	VENOJECT Ⅱ etc. Hemolyse tube 052-6360 052-6330	4,000	2,500	053-4980	—	024-1400	14.0	120
10／15	24	GL	15～17.2 × 89～105	C R	VENOJECT Ⅱ etc. Hemolyse tube 052-6330 *6		2,490	053-7340		024-2610	13.9	500
50	4	GL	27～37 × 95～110	R	VENOJECT Ⅱ etc. Hemolyse tube 052-6370		2,540	053-4990		024-3190	14.2	100
50	4	PL	30 × 117	C	Conical tubes FALCON etc.		2,560	053-5010		024-1480 *8	14.3	80
15	4		17 × 121				2,610		055-6010 *7	—	14.6	
50			30 × 117				2,500				14.0	

*2 GL : Pyrex Glass PL : Plastic

*3 C : Conical R : Round type

*5 Allowable load per bucket.
This load includes the weight of the sample, adaptor, tube rack, cushion, tube, cap, etc.
The weight of bucket is not included in the allowable load.

*6 When use 15 ml of spitz tube (Conical) use it with 3,000 rpm or less.

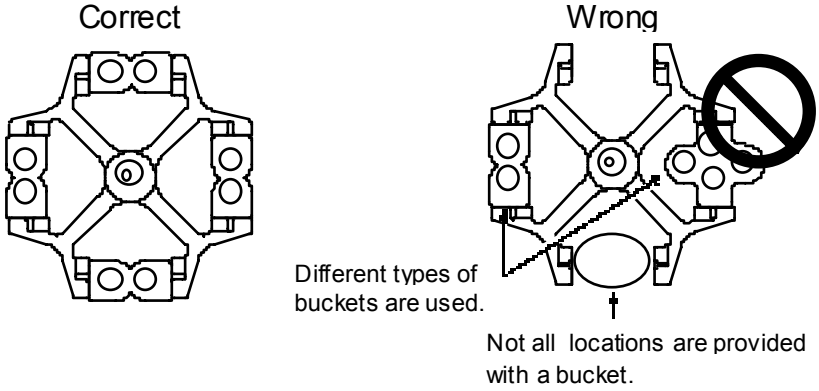
*7 Be sure to remove the cushion (No. 024-1480) and then use the adaptor (Code No. 055-6010).

*8 Cushion is included with this bucket.

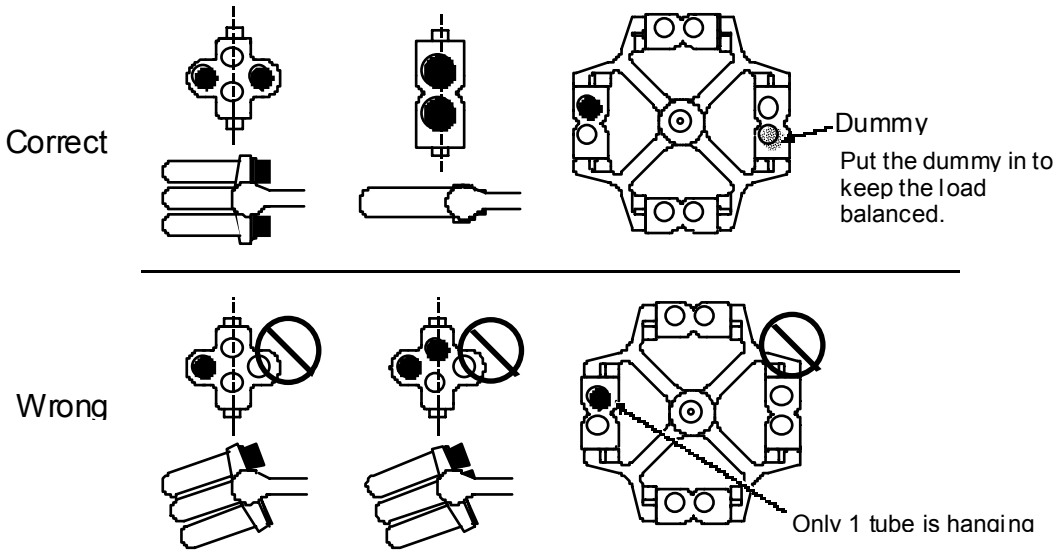
[2] Setting Buckets

⚠CAUTION

The same type buckets must be provided to every (4places) rotor yoke.
If not positively held in place, the rotor or centrifuge can be damaged, thereby causing accidents.



[3] Tube distribution method



⚠CAUTION

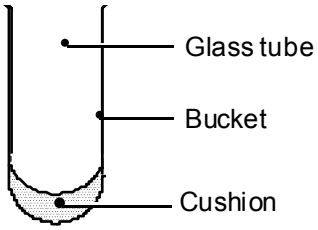
■ **Distribute the tubes symmetrically about the center of the bucket.**

- Appropriate balance is lost and violent vibrations can result if tubes are incorrectly arranged. And, unexpected accidents can result from such violent vibrations.
- The settling chamber may be tilted since the tubes can't be maintained horizontal during rotation.
- When you don't have enough number of tubes, dummy tubes shall be used to maintain symmetry of the both sides.

■ **Keep the load balanced symmetrically within 10 gram.**

[4] Cushions / Adapter

When glass tubes are used, be sure to use the cushion to avoid damage.
Insert the cushion into the tube rack so that its concave side faces upward.
If a glass tube is damaged, replace the cushion.
If broken pieces of the glass tube are contained in the cushion, the glass tube will be broken again.



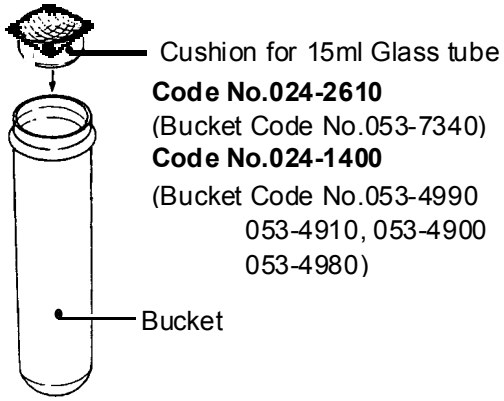
Do not insert the cushion upside down or in a slanted position, otherwise, the glass tube may be damaged or you may not be able to remove it.

(1) Cushion for 15ml and 50ml Glass tubes

How to place 15ml cushion

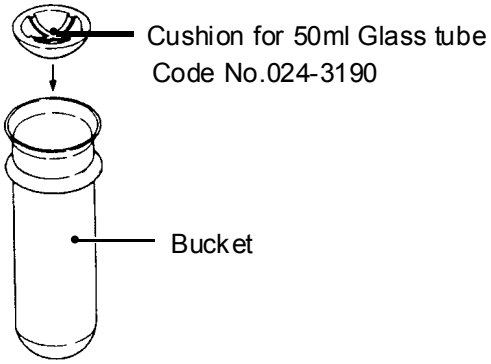
① Place a cushion in the bucket with the concave surface facing upward.

② Fully insert the cushion to the bottom of the hole using a glass tube.
(the edges of the cushion bend to prevent it from coming out.)



How to place 50ml cushion

Place a cushion in the bucket with the concave surface facing upward.



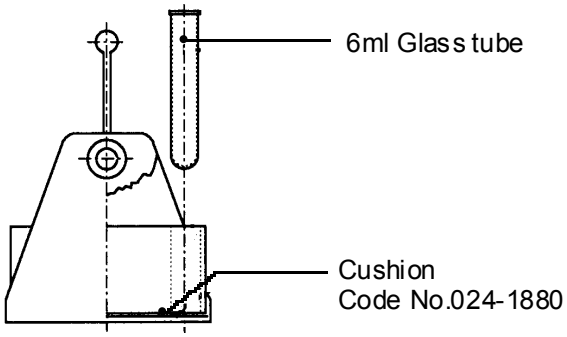
(2) Cushion for Carrier

The cushion for the carrier is shaped like a sheet.
The cushion is placed on the bottom of the carrier.

Cushion for carrier

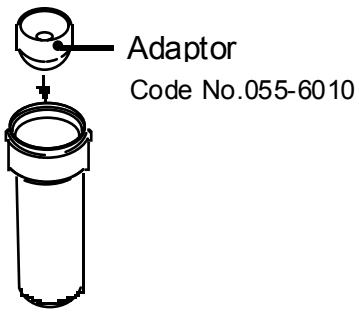
Carrier Code No.	Cushion CodeNo.
053-5040	024-1880
053-5030	
053-5850	024-1890

[Ex.] Carrier Code No.053-5030

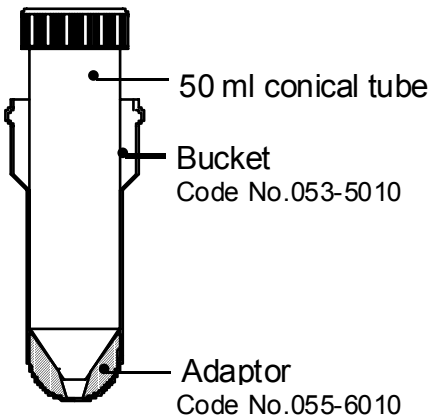


(3) Adapter for 15 ml / 50 ml conical tubes

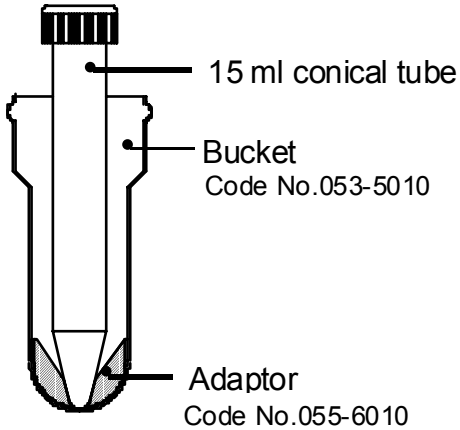
When using the bucket (code No. 053-5010) commonly for both a 50 ml and a 15 ml conical tube, an optional adapter (code No. 055-6010) must be used.



50ml conical tube

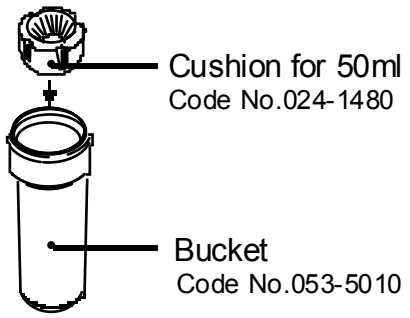


15ml conical tube



(4) Cushion for 50 ml conical tube

The cushion (Code No.024-1480) is fitted to the bucket (Code No.053-5010) and is exclusively used for the 50ml conical tube (culture tube).

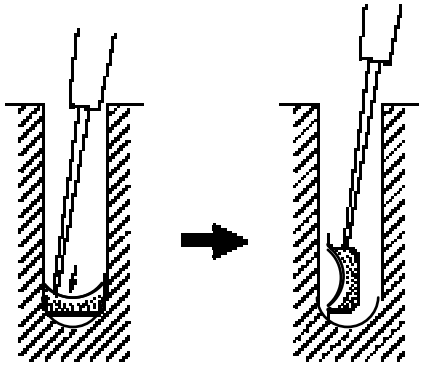


(5) How to remove cushion

① Stick the cushion with an eyeleteer or a pair of pointed tweezers.

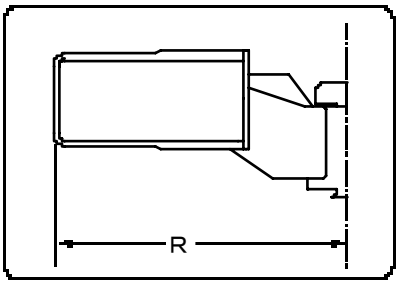
② Raise the cushion perpendicularly on the bucket bottom.

③ Stick the side of the cushion to take it out.



6－5. RS-1004 Swinging Bucket Rotor

［1］Specification



Maximum Speed (rpm)	4,000
Maximum R C F (× g) *1	2,590
Maximum Weight (kg)	1.9

Nominal Capacity ml	Number of Tube	Material of Tube *2	Tube Sizes Dia. × Length mm	Form *3	Tubes Code No.	Allowable Speed rpm	R C F × g	Bucket Code No.	Tube rack / Adaptor Code No.	Cushion Code No.	Maximum Radius R cm	Allowable load gram *4
5	16	GL PL	12.5～13.5 × 70～110	R	Becton, Dickinson Hemolyse tube	4,000	2,500	S13041 *5	S14033	—	14.0	350
5	20	GL PL	11.8～12.8 × 65～85	R	RIA tube		2,020	S13009	—		11.3	
7	20	GL PL	11.5～12.5 × 95～105	R	VENOJECT II etc. Hemolyse tube		2,400	S13004	—		13.4	
7	20	GL PL	11.5～12.5 × 65～105				2,500	S13041 *5	S14029		14.0	
15	4	PL	16.5 × 120.6	C	Conical tubes FALCON etc.		2,560	S13150 *6	S13060		14.3	
15	16	PL	15.2～16.2 × 80～110	R	—		2,500	S13041 *5	S14030		14.0	
15	8	PL	16.5 × 120.6	C	Conical tubes FALCON etc.		2,560	S13152	—		14.3	
15	16	PL	16～17 × 90～105	R	—		2,400	S13012	—		13.4	
25	4	GL	23～24 × 95～100	R	S15025		2,400	S13097	S17925	—	13.4	
25／30	4	GL	24～25.3 × 75～105				2,500	S13041 *5	S14031	Cushion is included with this tube rack.	14.0	
50	4	PL	29.5 × 117	C	Conical tubes FALCON etc.		2,590	S13150 *6*7	—	—	14.5	
50	4	GL	34～35 × 95～100	R	S15050		2,400	S13097	S17950	—	13.4	
50	4	GL	34～35 × 70～105				2,500	S13041 *5	S14032	Cushion is included with this tube rack.	14.0	
100	4	GL	44.5～45.5 × 95～105	R	S15100		2,400	S13097	—	S16051 Cushion is included with this bucket.	13.4	

*1 The Max. RCF is the calculation value of the Max. speed for the rotation radius of 14.5cm.
The value of the RCF that is indicated to the display is showing the value that cut the lower 2 digits.
▶ Refer to page 3-12.

*2 GL : Pyrex Glass PL : Plastic

*3 C : Conical R : Round type

*4 Allowable load per bucket.
This load includes the weight of the sample, adaptor, tube rack, cushion, tube, cap, etc.
The weight of bucket is not included in the allowable load.

*5 Sealing cap No.S17140 is included with this Bucket.

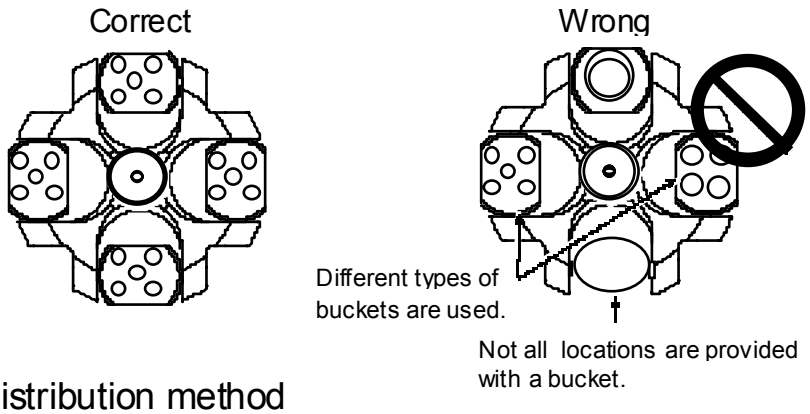
*6 Sealing cap No.S17151 is included with this Bucket.

*7 When using the adapter (S13060), 4 tubes of 15ml conical tube can be used.

[2] Setting Buckets

⚠CAUTION

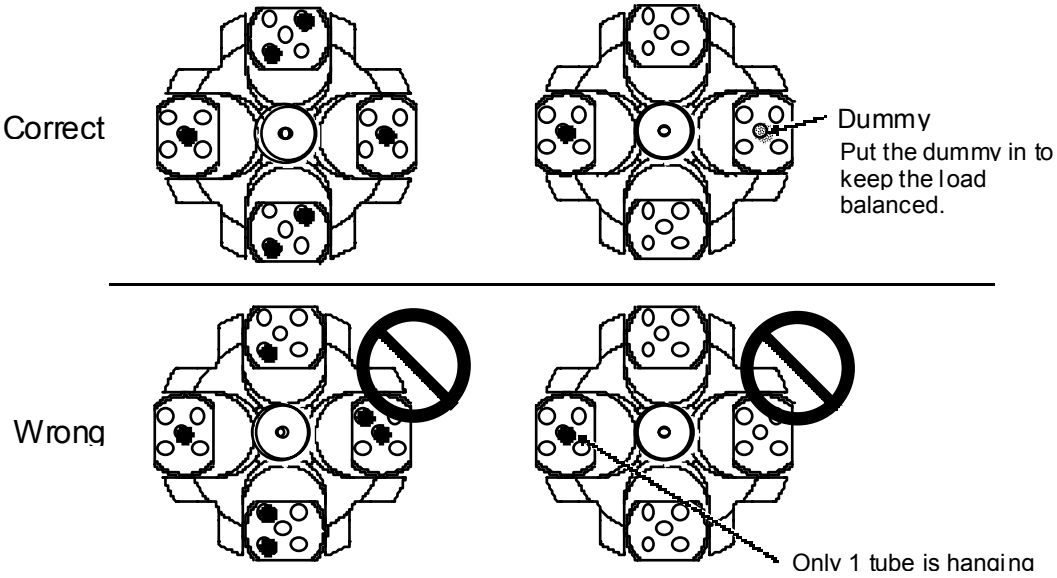
The same type buckets must be provided to every (4places) rotor yoke.
If not positively held in place, the rotor or centrifuge can be damaged, thereby causing accidents.



[3] Tube distribution method

⚠CAUTION

- Distribute the tubes symmetrically about the center of the rotor.
  Improper distribution will cause violent vibration resulting in damage to the centrifuge, or the rotor may come off.
- Keep the load balanced symmetrically within 10 gram.

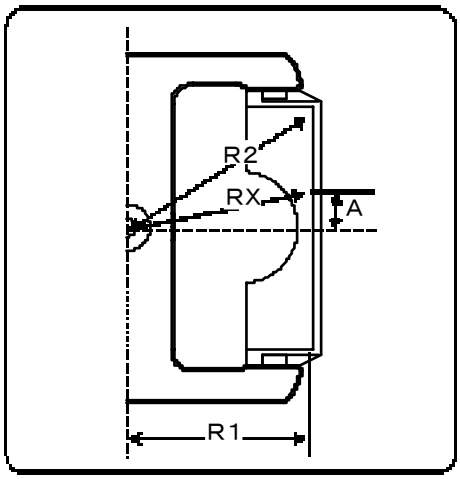


[4] Standard accessories

(1) Grease (SIGMA Parts No.70284) ····· 1Pc.
(2) Rotor knob ····· 1Pc.

6－6. RMP-23 Swinging Bucket Rotor

[1] Specification



Maximum Speed (rpm)	4,000
Maximum R C F (× g) *1	1,790
Maximum Weight (kg)	1.6

Number of wells	Number of Plate	Plate Material *3	Plate Sizes mm	Allowable Speed rpm	R C F × g	Buckets	Radius R_1 cm	Allowable load gram *4
96	2～6 *2	PL	86 × 128 × 52	4,000	1,790	Bucket is included with this rotor.	10	345
96	2	PL						

*1 The Max. RCF is the calculation value of the Max. speed for the rotation radius of 10 cm. The value of the RCF that is indicated to the display is showing the value that cut the lower 2 digits. ▶ Refer to Page 3-12.

*2 The maximum speed drops when the step number increases, although a micro plate is possible to piling 3 steps. ▶ Refer to Page 6-15.

*3 PL : Plastic

*4 Allowable load per bucket. This load includes the weight of the sample, plate, adaptor etc.
The weight of bucket is not included in the allowable load.

Calculating Centrifugal Force for RMP-23

Because of the size of the micro plate, the radius of rotation differs between the center and the both ends with respect to the rotation axis, resulting in the difference in the centrifugal force. The centrifugal force of the place A (cm) Distant from the center of a bucket can be calculated in accordance with the formula, where the rotation radius R shall be substituted with the Rx to be obtained by the formula mentioned below.

$$R_x(\mathrm{cm}) = \sqrt{R_1^2(\mathrm{cm}) + A^2(\mathrm{cm})}$$

where, R_1: Radius rotation Minimum (cm)

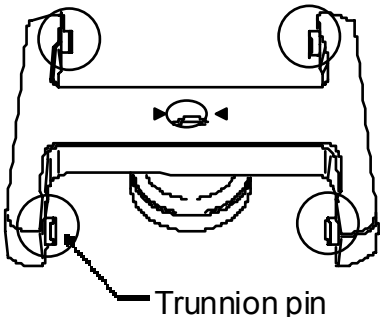
R_x: Actual rotation radius in a position which is A cm away from the center of the bucket.

[2] Check the trunnion pin

⚠CAUTION

Check the trunnion pin (4 places) is not loosened.
If the trunnion pin is loosened, the rotor or centrifuge can be damaged, thereby causing accidents.

If the trunnion pin is loosened, contact your local dealer for inspection.

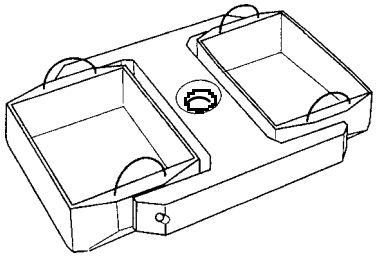


[3] Setting Buckets

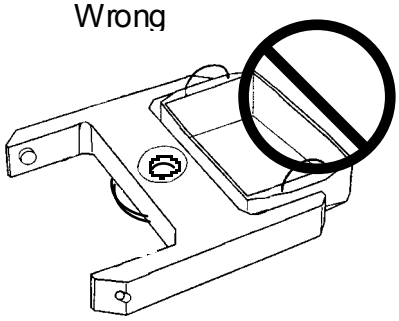
⚠CAUTION

The same type buckets must be provided to every (2 places) rotor yoke.
If not positively held in place, the rotor or centrifuge can be damaged, thereby causing accidents.

Correct



Wrong

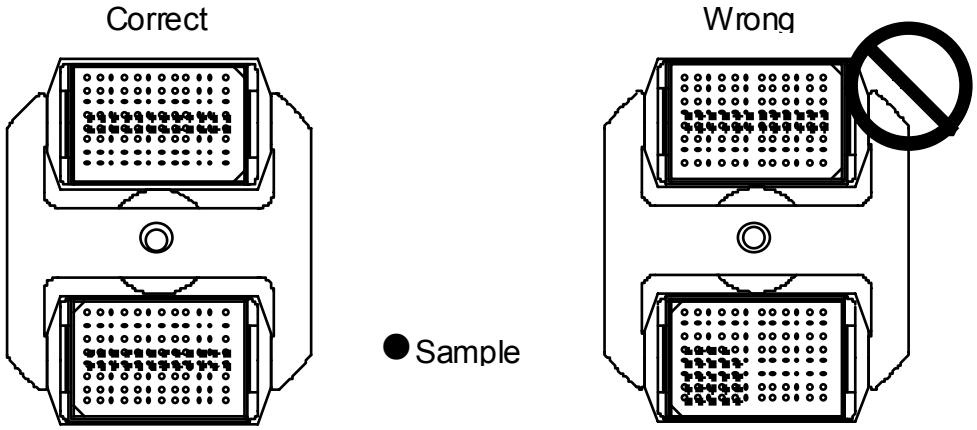


Load the micro plate after detaching the bucket from the rotor.

[4] Distribution of samples

⚠CAUTION

- Keep the load (of the sample) balanced.
  If an appropriate balance is not provided, unexpected accidents can result from a damaged rotor or centrifuge.
- Keep the load balanced symmetrically within 5 gram.



[5] Setting plate

⚠CAUTION

Use the same plates.
The wrong arrangement will cause imbalance and resulting in damage to rotor, bucket or the centrifuge.

[6] Allowable weight of plate

⚠WARNING

■ When pile up the micro plate to each bucket in 3 steps, use it after the sufficient test for the strength of the plate is made.
The more the micro plates are piled up, the easier the plate at the lower position becomes damaged.

■ When deep well plate is used, please ask the plate maker for the allowable RCF of the deep well plates.

■ Allowable weight of micro plate and cell culture plate put in the bucket is 345 gram. If it exceeds 345 gram, rectify reduced maximum speed by the following formula.
If it is not used at the rectified speed, the rotor and the bucket will be damaged, causing the accident.

$$\text{Reduced maximum speed (rpm)} = \text{Maximum speed (rpm)} \times \sqrt{\frac{\text{Allowable load (gram)}}{\text{Actual load (gram)}}}$$

[7] Standard accessories

Grease (SIGMA Parts No.70284) ····· 1Pc.

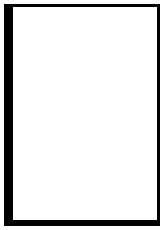
Section 7 Specifications

7－1. Centrifuge

Max. speed	4,000 rpm
Max. RCF	2,610 × g
Max. Capacity	400ml
Control system	Invertor Microprocessor control, Speed, Centrifugal force, time, acceleration / deceleration, 3 memory
Acceleration/Deceleration	Rapid, Slow, 4 ways of switching
Alarm display	Lid open, Imbalance, Over speed, Function for detecting an occurrence of electrical abnormality in speed sensor, invertor, Lid rock, Motor
Speed setting	Digital display, 200-4,000 rpm, in 100 rpm steps
Speed indication	Digital display, 0-4,300 rpm, in 100 rpm steps
RCF setting	Digital display, in 100 × g steps 10-2,600 × g（The centrifugal force differs by the rotation radius.）
RCF indication	Digital display, in 100 × g steps 0-3,000 × g（The centrifugal force differs by the rotation radius.）
Timer setting range	From 1 second to 99 seconds (1 second step) 1 minutes to 99 minutes(1 minutes step) HOLD
Setting the Sound that informs the end of the operation	5 kinds + Sound none
Rated voltage and Rated current	100-115 V 50/60 Hz 3 A 200-240 V 50/60 Hz 1.3 A
Total heat produced	100-115 V 180 W 0.65 MJ/h 200-240 V 170 W 0.62 MJ/h
Dimensions, Weight	35 (W) × 42(D) × 32(H) cm, 24 kg
Safety regulation	IEC 61010-2-020, CLASS Ⅰ
Operation environment	Temperature : 10 to 40 ℃ Atmospheric pressure : 70 to 106 kpa (700 to 1,060 mbar) Humidity : 30 to 85%

7－2. Standard Accessories

1. Instruction manual ·····1 Copy
2. Power cable ·····1 Pc.
3. Rotor locking nut·····1 Pc.



Section 8. Parts List

8－1. Recommended Spare Parts

Code No.	Description	Use , standard	Q'ty
014-0061	Micro switch	VX-016-1A3	1
014-0071	Micro switch	V-102-1A5	1
029-0010	Speed sensor		1
029-0009	CTL PC board	Without ROM	1
066-0016	CPU ROM		1
014-0056	Invertor	VFNC1S-1002P, For 100-115V	1
014-0057	Invertor	VFNC1S-2002PL, For 200-240V	1
017-0009	motor	KC128 0.18kW	1
014-0059	Solenoid	CKD DS-08A DC5V	1
014-4470	Circuit protector	W28 × Q1A-8, For 100-115V	1
014-0065	Circuit protector	W28 × Q1A-5, For 200-240V	1
014-0062	Switching requireter	CSJ010-05, For 100-115V	1
014-0063	Switching requireter	CWA015-05, For 200-240V	1
014-0064	Power switch	AJ921001WW3	1

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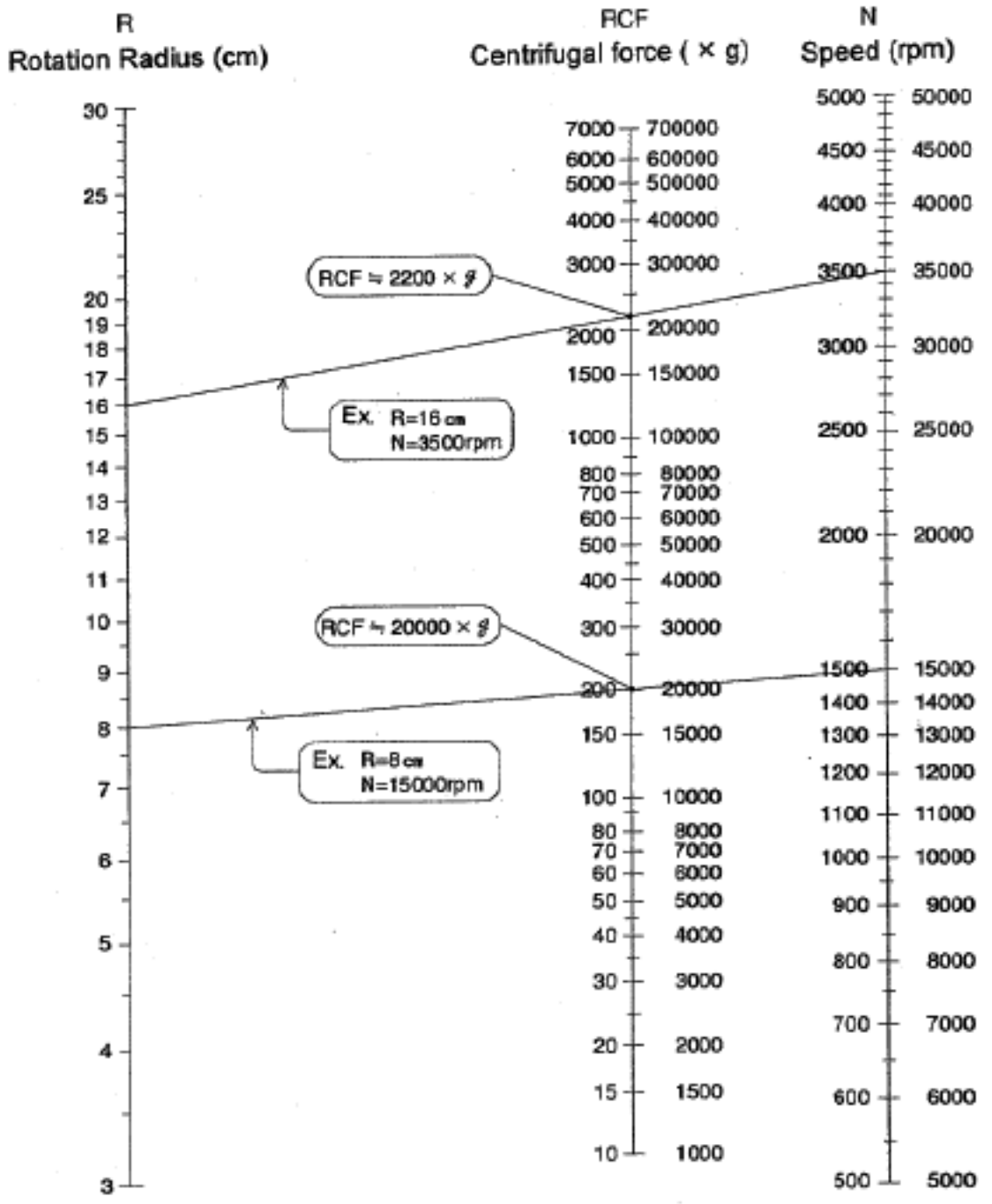
Nomograph for Centrifugal Force Calculation



How to use this Nomograph

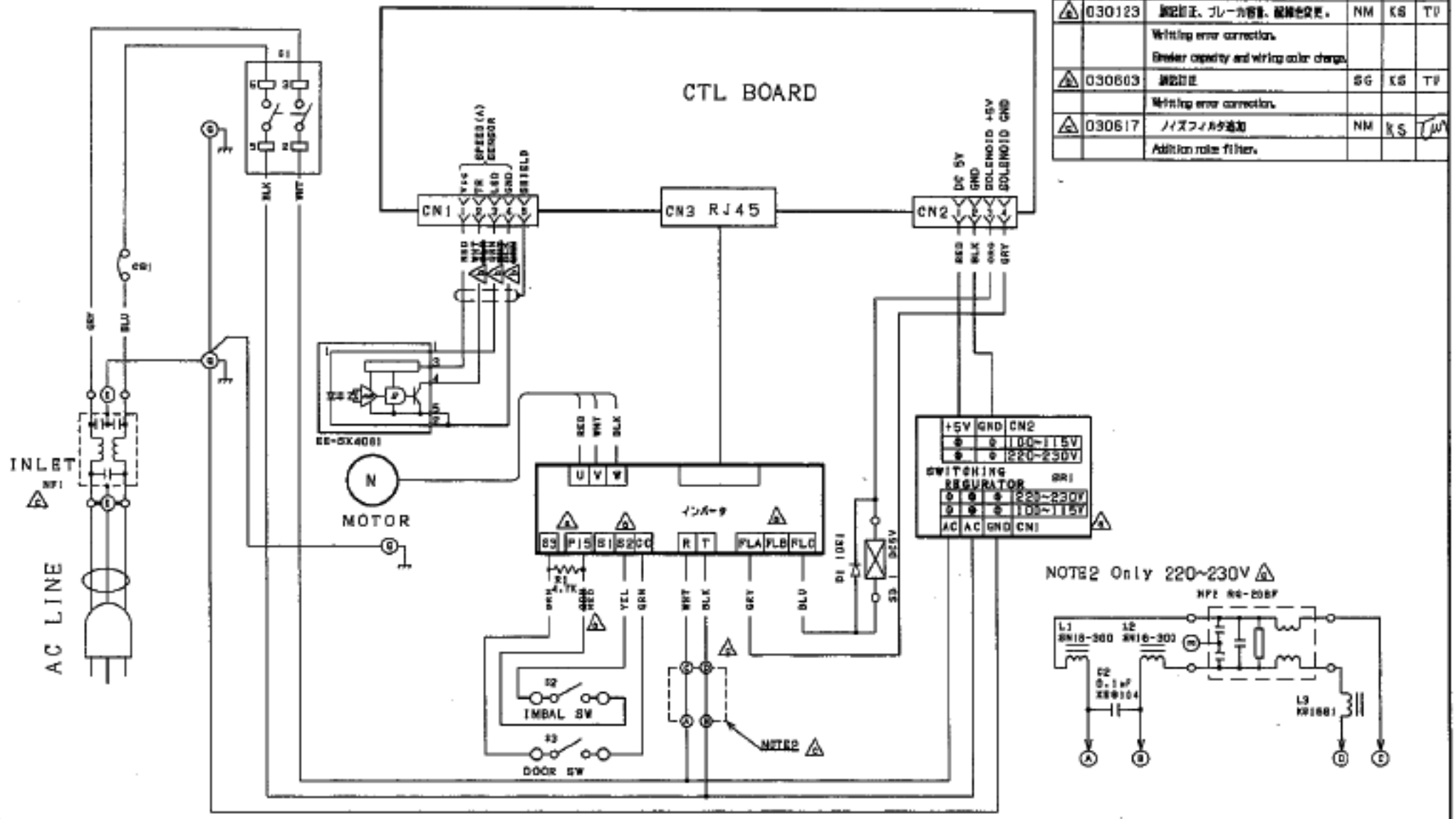
1. You can get centrifugal force (RCF) with line connection between rotation radius (cm) and speed (rpm).
2. You can get speed (rpm) with line connection between rotation radius (cm) and centrifugal

Calculating Centrifugal force

$$RCF = 11.18 \times \left(\frac{N}{1000}\right)^2 \times R$$

RCF : Centrifugal force (× g)
R : Rotation Radius (cm)
N : Speed (rpm)

REV	DATE	DESCRIPTION 内容	SIGN	CHKD	APPD
A	030123	誤記訂正、ブレーカ容量、配線色変更。	NM	KS	TF
		Writing error correction.			
		Breaker capacity and wiring color change.			
A	030603	誤記訂正	SG	KS	TF
		Writing error correction.			
A	030617	ノイズフィルタ追加	NM	KS	TF
		Addition noise filter.			



NOTE1

	100~115V	220~230V
CB1	W28XQ1A-10 A	W28XQ1A-5
SR1	CSJ010-05	CWA015-05
INLET/NF1	S-180	GL-2080C4 A

TITLE	CIRCUIT DIAGRAM
SCALE	1:1
QTY	
3rd ANG	
MATERIAL 材料	
MODEL 機種	2410/2420
DWG 名称	結合回路図
DSG K S	02・08・21
DWG N M	02・11・28
CHKD K S	02・11・28
APPD M H	02・11・29
MASS 質量 kg	
CODE NO	
DWG NO 図番	3W2333C
OLD DWG NO 旧図番	

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